

SCIENCE.

FRIDAY, APRIL 29, 1887.

COMMENT AND CRITICISM.

THE ENGLISH ARE WORKING themselves into no slight excitement over their industrial position. They believe that they are losing ground as a nation, and both statesmen and scholars are looking for the cause and the cure for this unfortunate state of affairs. Lord Hartington and Professor Huxley have recently addressed their countrymen on this topic in a most interesting and suggestive manner. Professor Huxley compared the industrial forces of Europe to the organization of the great standing armies, and he asserted that the industrial competition of the present is really a state of war, though carried on for different objects and with far different results from those of ordinary warfare. "It does not break heads, and it does not shed blood," said Professor Huxley, "but it starves the man who succeeds in the war of competition, and the nation which succeeds in the war of competition beats the other by starvation." Lord Hartington accepted this metaphor as expressing the truth, and drew a most pitiful picture of what England would become were she defeated in this industrial warfare. "The consequences to the nation would be a diminution of wealth and of the influence which we have acquired through our pre-eminent industrial position. What would this country be without its manufactures and industries? No doubt we should still have our material resources, our iron and steel, and the muscular energy of what would then be our superabundant population; but, instead of being where we are now, we should be hewers of wood and drawers of water for the world. If ever our raw materials could be manufactured for the uses and wants of the world better in other countries than in our own, we should become the slaves and servants of the rest of the world, instead of its leaders and masters, as we have been hitherto."

But, Lord Hartington continued, the ill would not be confined to the country as a whole. It would be visited upon individuals. This imped-

ing industrial defeat would mean a disastrous change in the circumstances of almost every private person. The result would be "a loss of affluence to those now rich, poverty to those now prosperous, and to the masses of the country to those whose only means of subsistence is the demand for their manual and intelligent labor, it would mean famine, indigence, and starvation." The speaker asserted that the plain truth was, that, just as in actual warfare, victory in the industrial struggle can only be secured by the possession of scientific knowledge and the application of the most scientific instruction to the masses of the people. At the present time, Germany and France are making enormous efforts to provide adequate technical instruction for the people, and the lesser continental nations are following their example. England is lagging in this respect. Much has been done by the employers of labor, but much remains to be done. Lord Hartington expressed the hope that in every considerable centre industrial and technical schools would be established, suitable to the wants of the particular district. Professor Huxley has since returned to this point, and eloquently urged the necessity of organizing industrial education. He has pointed out what general direction this organization should follow, but has not entered into any details. It is certainly suggestive, however, to find the very first of England's statesmen and scientists uniting in their appreciation of the danger which threatens Great Britain, as well as agreeing that industrial and technical education is the proper means of avoiding this danger.

AS IS THE CASE with most other similar institutions in the eastern states, a considerable share of the work of the Massachusetts agricultural station is purely chemical. The report for 1886 contains the results of some hundred and sixty or more analyses of fodders, dairy products, fertilizers, water, etc.; and this portion of the report is evidently thoroughly good of its kind, and cannot fail to be of service to the farmers of the state. The field and feeding experiments are made more prominent in the report, however, than the chemical work, as befits their greater general

interest; but the impression left by a careful perusal of them is not altogether satisfactory. In some cases a large amount of data has been obtained, as in the feeding experiment; but the results are presented without any adequate discussion, — a too prevalent habit among our stations. Others of the experiments would be more properly called observations, and, while of value, scarcely require the apparatus of an experiment-station for their making; while still others seem to lead to no definite end. While much has been done, and in various directions, we fail to find in the report any exhaustive investigation of any subject, such as it is the peculiar province of the experiment-station to undertake. The tendency appears to have been to select those simpler forms of experiment which give an answer in gross to some question of present interest in practice, rather than to attempt to reduce the question to its elements and elucidate the action of the various factors which enter into the answer.

PERHAPS NO ONE is better fitted by training and experience to discuss intelligently the problem of municipal government in the United States than Mr. Seth Low of Brooklyn, and his address on this topic before the Historical and political science association of Cornell university is very full of information and suggestion. It has needed neither de Tocqueville's warning nor the data given in the current issue of the *Andover review* to impress upon us the fact that this is the age of great cities, and that it is in the cities that republican institutions will be put to the severest test. Mr. Low points out that the task of administering a large city's affairs is more difficult in this country than in Europe, because of its heterogeneous population and rapid growth. He adds that "the struggle in city government in the United States is not so much to secure the doing of a necessary thing, as it is to procure the doing of it economically, efficiently, and honestly."

The problem is therefore one in administrative science. The first consideration is to eliminate national politics from municipal elections. In order to this, Mr. Low recommends that municipal elections be held at a time when there can arise no complication between its issues and those of national administration. Then the city charter should carefully separate executive and legislative functions. The mayor should have the power of

appointment and removal of executive officers during the time for which he is responsible for the government of the city. The extent to which cities may incur debt should be absolutely fixed by constitutional limitation. All these and several other essentials are strongly urged by Mr. Low. He shows very clearly by practical illustrations just what the lack of such provisions has resulted in. The whole address is thoroughly scientific in character, and leaves the impression that the government of cities is a matter requiring far more intelligence and devotion than it usually has bestowed upon it.

THE *Sanitary news* reports that the sanitary committee of the Philadelphia board of health has decided that there is no harm in using distillery slops to feed milch-cows when supplemented by more nourishing food. If such action has been taken, it is certainly a step backward in sanitary administration. It is well settled that distillery swill in any amount is an unnatural food for milch-cows, and that the milk produced from animals so fed is unwholesome and injurious. A case is reported by the Brooklyn board of health in which it is believed to have caused the death of a child. Swill acts as a stimulant to the milk-glands, and the quantity of milk secreted is increased, while the quality is depreciated. It is to obtain a greater amount of the product that the dairymen desire to use swill; and a long experience has convinced the writer, that, if this food is permitted to be used at all, it will soon be the principal, if not the sole, food. We sincerely hope that the Philadelphia board of health will reconsider its action, and make a more extended investigation into the subject; for we feel sure that there is ample evidence on record to demonstrate to the satisfaction of any board of health that distillery swill is totally unfit food for milch-cows, even though it is given in restricted amount and in connection with other food.

GATSCHET'S ETHNOLOGICAL MAPS OF THE GULF STATES.

MR. A. S. GATSCHET'S researches on the history and ethnology of the Creek Indians have led him to a thorough examination of the available literary material referring to the Indians of the Gulf states. The results of his studies are contained in his book, 'A migration legend of the Creek Indians,' and may be seen by a single glance at the maps pub-

lished in this number. The relations of the tribes are explained by the author in the notes accompanying the maps (p. 413). We wish to draw attention to the importance of ethnological researches of this kind.

Students of American ethnology feel hampered everywhere by the lack of reliable observations and the want of linguistic material. We fully agree with the author, who emphasizes, in the preface of his book, the fact that the method of furthering ethnographic study by all the means which the study of language can afford, has been too little appreciated up to the present time. The careful observer, inquiring into the psychology and ethnological character of a nation, will feel compelled to learn its language as the only means of understanding the way of thinking of the people he studies. But, besides this, the comparison of languages is one of the most powerful helps for studying the prehistoric history of mankind. The material available for a study of the Indians is in part very scanty, and much of it is irredeemably lost, the languages and tribes being extinct. Much, however, might still be saved, if public interest would encourage and support researches in this field. The philosopher cannot but regret the indifference of the public towards these studies, which are the principal foundation of a psychology of mankind. The scientific institutions which take an active interest in this matter are not many, and do not command over-large funds. The bureau of ethnology, which has done and now does most of this work in the field, is hampered by lack of means. Academies and societies are generally more interested in archeology than in ethnology. We wish it might be better understood that the only way to understand the relics of a dead culture is the study of the living one; but we fear the interest in the Indians will not be aroused until they all are buried. Then their irrecoverably lost legends and customs, character and ideas, will seem to grow in value, and much work and money will be wasted in researches that might now be successfully done at a small expense.

It is not too late, however. Much may still be done by intelligent and careful collectors and observers, and we hope that the growing interest in science will also extend to ethnological researches. Astronomers, geologists, students of natural history, are receiving ample support from their rich fellow-citizens. Ethnology may gain friends too, which will enable students to carry on their researches and to collect material before it will be too late.

Gatschet's first map is an attempt to locate the settlements pertaining to the Indians of each of the linguistic families of the Gulf states as far as

traceable in the eighteenth century. For this period of the history of the Gulf states, our remarks are particularly true, and our knowledge of many tribes is merely derived from occasional remarks of early writers. Enormous materials of this kind are embodied in the map which shows where the tribes were located. The author prefers to mark the territory inhabited by each tribe by dots, as answering better the purpose than the coloring of large areas, which conveys the impression that the population was scattered all over a certain country. He says (p. 49), "This will do very well for densely populated countries or for tracts inhabited by roving, erratic Indians, whom we meet only on the west side of the Mississippi River. The Gulf state Indians were not longer in the condition of pure hunting tribes; they had settled in stationary villages, and derived the main part of their sustenance from agriculture and fishing." As far as the map is intended to show the exact state of our knowledge, this opinion is correct. The question, however, is not so easily settled. The migrations of tribes, the shifting of villages, hunting excursions, and many other facts and habits, tend to make the territory of a tribe indefinite; while, on the other hand, lands, though not inhabited, are claimed by a tribe as their possession. These are some important points in favor of coloring large areas.

It will be seen on the map that the Maskóki occupied a central position. The large extent of their territory, their numbers, and their character, made them one of the most important groups in Indian history. In former times the tribes probably extended from the Atlantic to the Mississippi, and beyond that river, and from the Appalachian range to the Gulf of Mexico. They kept up a warfare with all their neighbors and among themselves; their main branches, the Creek and the Cha'hta Indians, constantly being at war. The dialects of the linguistic stock greatly differ from each other, the Cha'hta, for instance, being unintelligible to the Creek. Gatschet divides them in four groups,—the Creek, Apalachian (Hitchiti), Alibamu, and Cha'hta. The Creek Indians occupied in historical times a central position among the other Maskóki tribes, and, by forming a strong and permanent national union, had become the most powerful of all the southern tribes.

Their traditions say that they came from the west, and immigrated into their territory in the eastern Gulf states after crossing the lower Mississippi. According to their migration legends, the Kasi'hta and Kawita tribes were the first to reach the Chatahutchi River, where they found the Kusa and the Apalatchukla settled. The situation of these places will be found on the map. All other

settlements on the Chatahutchi River seem more recent than Kasi'hta and Kawita, and therefore it is probable that the Creek immigration to those parts came from the Coosa and Tallapoosa rivers.

The villages of the Creeks are built along the banks of rivers and brooks, frequently in places subject to inundations. They consisted of irregular clusters of houses. Each of these belonged to a gens, or clan, of which there were a great number, twenty of which are still in existence. Only the larger villages had a public square occupying a central position. This was reserved for the celebration of festivals, especially for that of the annual fast, which is the most prominent one among their feasts. On the square stood the council-house. The Creeks distinguished two kinds of towns,—the red or war town, and the white or peace towns. While the former were governed by warriors only, the latter had a civil government. One of the most noteworthy of the peace towns was Apalatchukla. It was considered the mother town of the Creek confederacy. No captives were put to death, no human blood was spilled there. Deputies from all Creek towns assembled there when a general peace was proposed. On the other hand, Kawita-Tallahassi, a few miles north of Apalatchukla, was an important war town. Here the chiefs and warriors assembled when a general war was proposed, and here captives and state malefactors were put to death.

Gatschet's researches on the ancient pathways are of particular interest. A detailed study of trails leading through the country forms an important part of Indian history and ethnography. But unfortunately only very few are traceable at the present time. He describes four trails leading from the eastern states to the Creek towns, crossing the Chatahutchi River by means of fords.

We cannot enter here upon the ethnographic and linguistic details contained in Gatschet's book, but confine ourselves to the foregoing remarks, which will be explanatory of part of the vast amount of information contained in the maps. It must be regretted that the publication of the second volume of Gatschet's work is delayed so long, as it will undoubtedly further our knowledge of North American ethnology as much as the first one has done.

PARIS LETTER.

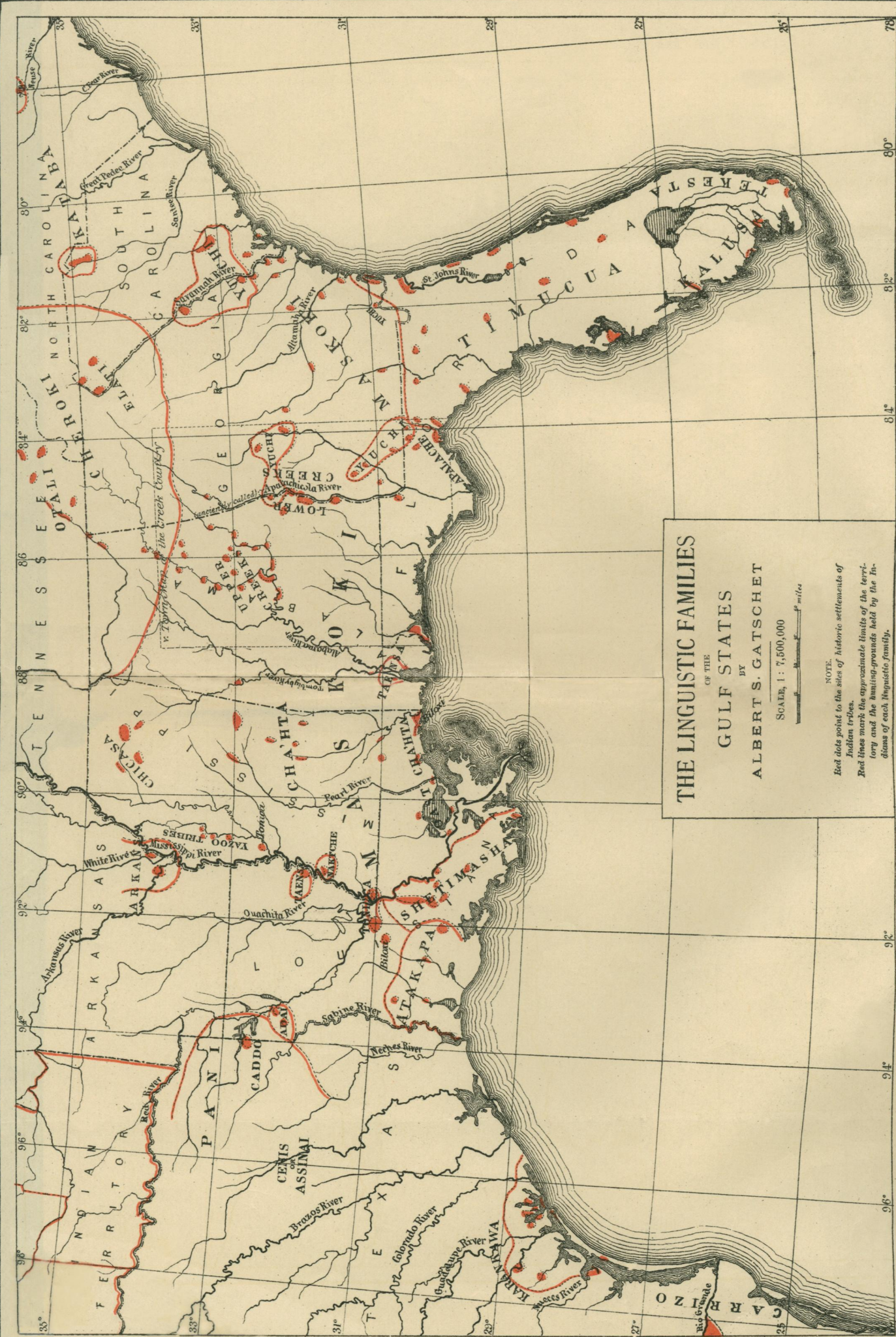
M. BROWN-SEQUARD has been elected president of the Société de biologie in place of the late Paul Bert.

The principal conversational topic of scientific interest at present is the particularly significant relationship existing between typhoid-fever extension and the quality of the water distributed in Paris. It is known that Paris receives its drink-

ing-water from three principal sources: very pure and palatable water is furnished by two rivers whose waters are brought into Paris by means of aqueducts, namely, the Vanne and the Dhuis; second-rate water comes from the Ourcq River; finally, Seine and Marne water is, on account of its impurity, especially used for public purposes,—street cleaning and watering, fountains, etc. But, although the last water is generally not mixed with pure drinking-water, it often happens, especially in summer, that the Dhuis and Vanne do not furnish water enough, so that it becomes necessary to use Seine or Marne water. The consequence is, that, some time after this mingling of the pure with the impure water, typhoid-fever becomes much more prevalent. For instance: for seven weeks during which pure water is distributed in the whole of Paris (May 3–June 16), the number of typhoid-fever cases applying to the hospitals is 149. From June 9 to June 20 the Seine water is mingled with that of the Dhuis and the Vanne. During the seven weeks from June 21 to Aug. 8, the cases are 472. The number of cases begins to increase between eighteen and thirty days after the admixture of the impure water. The same relationship exists in most epidemics of typhoid-fever, between the nature of the water-supply and the frequency of the disease. Another very significant fact is, that, in barracks where the water is good (Vanne water), the death-rate from typhoid-fever is only 0.7 per cent, while in barracks (although quite new and very healthy otherwise) where Marne water is used, the death-rate rises (from typhoid-fever alone) to 17 per cent. If these facts are confirmed,—and it is unlikely that they should not be so, since a recent investigator, M. Thoinot, has found the typhoid bacillus in great numbers in Seine water taken at the very place where it is pumped for the municipal reservoirs,—the Paris board of aldermen will have to give up using Seine water, and will be compelled to secure pure drinking-water elsewhere, if it does not wish to be called, with just reason, a cold-blooded murderer, which it seems to be at present. Such a state of things is a shame to a city like Paris, and in an age of science like that in which we live.

The senate committee for the abatement of alcoholism in France has just reported, and proposes that all non-ethylic alcohols shall be excluded from wines and liquors, as they are poisonous. This is very well, but will it be very easy to devise an instrument or a chemical method for the discovery of non-ethylic alcohol in wine or spirits?

The Paris academy of medicine is going to discuss, some time hence, the question of mental overwork; and the results of these discussions,



THE LINGUISTIC FAMILIES

OF THE
GULF STATES
BY
ALBERT S. GATSCHET

SCALE, 1 : 7,500,000

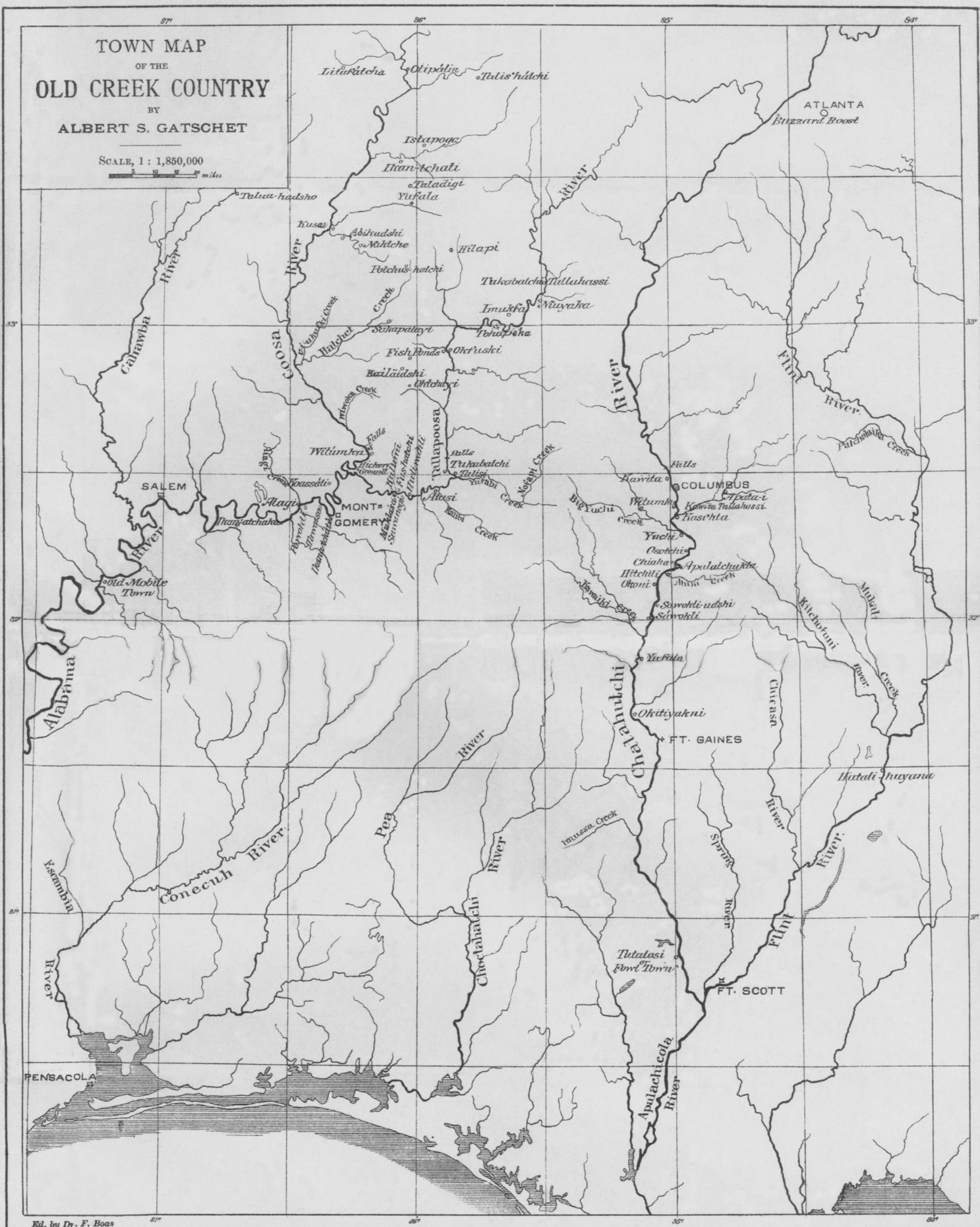
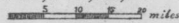
Scale bar showing 0 to 100 miles

NOTE.
Red dots point to the sites of historic settlements of Indian tribes.
Red lines mark the approximate limits of the territory and the hunting-grounds held by the Indians of each linguistic family.

BY
ALBERT S. GATSCHET

SCALE, 1 : 1,850,000

5 10 15 20 miles



Ed. by Dr. F. Boas

HART & VON ARX, 19 PARK PLACE, N.Y.

if carefully prepared and well backed by good documents, will certainly prove most interesting. The evil effects of overwork must certainly be enormous in France, not only from the mental point of view, but also as concerns the influence on physical development; all the more so that gymnastics and sports are not enough sought for and cultivated to counteract the bad effects of mental strain.

M. Levasseur, of the Académie des sciences morales et politiques, has recently published a paper concerning the average length of life in France at the present day and a century ago, in 1789 and 1881. The following table summarizes the data for different periods of life, the numbers indicating the ratios of survivors per thousand:—

Age.	Before 1789.	1877-81.	
	Both sexes.	Male.	Female.
5	583	716	744
10	551	693	719
15	529	680	703
25	471	631	657
35	404	574	596
45	334	512	539
55	257	433	470
65	166	320	362
70	118	245	291
75	72	161	199

The following table summarizes the ratio of average life length in France, England, Belgium, and Norway, calculated for a thousand infants of both sexes:—

Age.	France.	England.	Belgium.	Norway.
10	681	703	689	780
20	642	663	635	742
30	584	604	573	691
40	533	539	511	635
50	473	464	440	570
60	289	370	315	486
70	249	238	216	349
80	89	89	75	157
90	11	11	9	26

It will be easily perceived that the average length of life has increased greatly since a century ago in France, and that it stands generally on a par with that of England, being superior to that of

Belgium, but inferior to that of Norway. The pre-eminence of Norway is due not only to the low death-rate of infants, but to that of all ages of life. Other tables show that life is generally longer in females than in males.

M. Armauer Hansen, whose works concerning leprosy are well known, has recently published an interesting paper concerning septicaemia in whales. Near Bergen, each year, one or two *Balaenoptera rostrata* are regularly caught. The way in which it is done is very simple. The small bay into which the whale has come is shut by means of a net,—this is quite enough to prevent the egress of the animal,—and then the fishermen try to harpoon it. The animal belongs to the fisherman whose arrow or spear has proved fatal. The fatal wound is recognized easily by the fact that all around it there is a zone of mortification some days afterwards. The animal does not die immediately. Some twenty-four or thirty-six hours after the wounds have been inflicted, the animal, which continues roaming about in the bay, seems sick: it comes oftener to the surface to breathe, and is less rapid in its movements. It is then harpooned and hauled ashore. One of the wounds, as before mentioned, is found to be surrounded by a zone of mortified tissues. All the fishermen then dip their arrows and spears into the wound to poison them. In fact, the whales are killed by septicaemia, for both Hansen and Gade have found in the wound a quantity of bacilli, always the same. Cultures of these bacilli succeed very well, and now inoculations upon rabbits are going to be tried. The curious feature of this fact is that this method of whale-capturing has been in vogue for many thousand years, since the epoch of the vikings.

Many interesting books have been published since my last letter. Professor Frédéricq of Liege has published the first volume of the annals of his laboratory. It contains many interesting papers by the able young physiologist and many other scientists.

Professor Hayem has issued a volume on the great therapeutical methods. It is a useful book, in which the philosophy of therapeutics is well expounded. M. G. de Kerville has published a book on evolution. It is a popular but very satisfactory account of the basis of evolution, of the facts adduced in support thereof, and of the difficulties the great Darwinian theory encounters.

It would be useless to say a word in praise of the late Würtz's 'Biological chemistry,' which is now complete. This work is a very good one, clear and precise, as that regretted master always wrote.

V.

Paris, April 8.

ATHENS LETTER.

THIS has been an important day for American students in Greece, and for the friends at home, of the American school of archeology. The corner-stone of the permanent home of the school has finally been laid, and, after five years of existence without a house of its own, the school will in a few months be commodiously and permanently accommodated. The building, in course of erection under the supervision of Mr. Trowbridge, was planned by Professor Ware of Columbia. It occupies a charming site a short distance east of the palace, on an eminence fronting Hymettus. The land, which adjoins that of the English school, is the gift of the King of Greece, and was obtained chiefly through the exertions of minister Fearn. The building will afford accommodations for the director of the school and for the students, as well as for the library and working-rooms.

This afternoon most of the Americans in Athens assembled about the new building, over which floated the flags of the United States and of Greece. Upon the platform were the United States and British ministers, and representatives of the Greek government, as well as of the English, French, and German schools in Athens. U. S. Minister Fearn, in laying the corner-stone, spoke in earnest words of the importance of the school for classical studies, and congratulated his countrymen that their school would now be on an equal footing, so far as accommodation is concerned, with its sister institutions of other nations. Copies of the Athens daily papers, and a box of Greek, English, and American coins, were put in the stone, which was then formally placed in position.

Minister Fearn was followed by Professor D'Ooge, the present director of the American school, who described its sphere, and spoke of its needs and its resources. M. Dragoumis, Greek minister of foreign affairs, spoke cordially of the work accomplished in Greece by the Americans, saying that "Greece could not forget that the first well-organized schools in Greece were established by Americans." M. Foucart, director of the French school, was unavoidably absent, as was also the well-known architect, Mr. Penrose, head of the English school, who, however, watched the proceedings with hearty interest from the window of the neighboring school, while his part in the exercises was taken by Mr. Walter Leaf of London, whose Homeric studies have made his reputation. Dr. Petersen spoke for the German school, and the proceedings came to an end with a libation in which all the assembled friends participated. The school is now fairly well established, but too little is known of it at

home. Unlike the other schools, which are well supported by their respective governments, our school depends entirely on voluntary contributions; and the responses to its appeals have heretofore been in no wise adequate to its needs. Little has been done by way of presenting its claims, save by circulars issued to the various alumni associations, and funds are urgently needed for the successful carrying-on of this most important work.

A sufficient sum has been raised to erect this new building, and nearly enough more to make provision for the permanent director, but a fund is needed for excavations. The school has just decided on uncovering some important ruins north of Corinth, but the money to prosecute the work is not at hand. Friends of classical study should contribute liberally to place this American school on a suitable basis, and enable it to go on unembarrassed with its work. Hitherto the various colleges have taken turns in sending out a Greek professor to fill the post of director for a year. But it is found that considerable time is needed for each new director to become acquainted with his work, and thus much of his year is spent to no advantage to the school. Charles Waldstein, a graduate of Columbia, and more recently director of the Fitzwilliam museum of the University of Cambridge, has signified his willingness to accept the permanent directorship, and will assume control in 1888. The students, of whom there are at present nine, assume all of their own expenses, and all that is now asked for is an amount sufficient to defray the cost of excavations and the annual running expenses. R. A.

Athens, March 12.

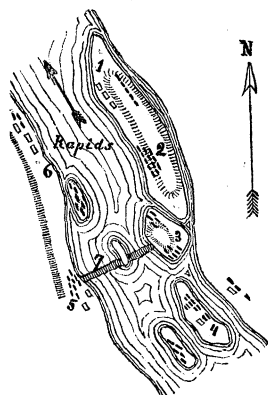
EXPLORATION AND TRAVEL.

The Stanley Falls Station.

During the past few months the Stanley Falls Station has been attracting considerable attention. According to O. Baumann, member of Dr. O. Lenz's African expedition, who staid several months there (*Mittheil. Vienna geogr. soc.*), the station is situated on the west point of a long island which is separated from the mainland by a branch of the river, about sixty feet in width. A path leads from the station to the numerous huts of Singi Singi's village. The island rises gradually from the river; but the right bank of the Kongo is formed by a steep wall like cliff of red sandstone, the strata of which lie horizontally. Its top is covered with luxuriant vegetation, which surrounds Nsaki's village. Tippo-Tip's village is established on two islands above the seventh cataract, the houses being scattered over his extensive plantations. Be-

low the cataract, on the left bank of the river, there are two villages belonging to two of Tippo-Tip's followers, — Nasr and Mvana Nsigi. They are built in the midst of thick woods, which are said to extend three days' journey from the river, and to be uninhabited. The Kongo, which runs at Tippo-Tip's village very rapidly, forms a little above the station the famous seventh cataract which impressed itself so deeply upon Stanley on his journey across the continent. Though the fall is only about six feet high, the impression is grand, on account of the enormous volume of water and the uproar of the tumultuous waves below the falls.

The inhabitants of this district are the Wagenia (Stanley's Wenyä); but also Tippo-Tip, with his



STANLEY FALLS.

- | | |
|---------------------------|---------------------------|
| 1. Stanley Falls Station. | 5. Nasr's village. |
| 2. Singi Singi's village. | 6. Mvana Nsigi's village. |
| 3. Nsaki's village. | 7. Seventh cataract. |
| 4. Tippo-Tip's village. | |

Arabs and slaves, and the station garrison, are established here. The latter was commanded by two whites, and had one hundred and fifty soldiers and working-men. These were composed of so-called Hausa (men from the Guinea coast and the Niger) and Bangalla, men from the upper Kongo, of the same tribe who so furiously attacked Stanley on his descent of the river. Besides these, there were a number of women and children, — slaves taken by Tippo-Tip on his predatory excursions to the north, and sold to the station. Many of the women had become wives of the Hausa: others were working for the station. The men were clearing the dense woods which surround the houses of the station, filling the swamps of the island, and working on the plantations. Bananas, manioc, and maize were grown there. Sweet-potatoes, papaya, and lemons were introduced from the lower Kongo. Tippo-Tip, who has large rice-plantations on the Lualaba and at Stanley Falls, furnished the station with rice. The stock consisted of three

cows, several sheep, goats, and some poultry. The climate is very unhealthy all the year round. It appears that the natives, who were employed by the station, were kept as slaves used to be in the southern states.

The Wagenia live on friendly terms with Tippo-Tip, who uses them for boatmen in travelling up and down and in crossing the rivers. They are fishermen. By far the greater part of their food is obtained in weirs built in the rapids and cataracts of the Kongo. Baskets are fastened to a line of heavy poles, which are strengthened by cross-beams, and the fish are carried into them by the rapid current. The fish are smoked, and traded to the inhabitants of the Lindi and Bivere for bananas and other vegetables or for iron spear-heads and daggers. The Wagenia wear teeth in perforations of the upper lip, beads in the nose and in the ears, and rings of copper, iron, or brass round the neck, arms, and legs.

Their trading excursions to the tribes below the cataracts are made in their large canoes, which have a platform for the steersmen on each end. On extensive journeys, they cover the boat with a roof, under which they build a fireplace of clay. It is remarkable that no demoralization through the influence of the Arabs has thus far been noticeable. The latter are ravaging the whole district, particularly the country north of the Kongo, and it may be expected that their influence will spread out still further, now that the station has been abandoned.

Africa.

According to *Nature* of April 14, the Swedish government is preparing an expedition under the direction of Lieut. A. Wester, formerly chief of the Kongo Station, Leopoldville. At the last meeting of the Stockholm society of anthropology and geography, Lieutenant Wester reported on the subject. The expedition may probably start next summer, and will be absent about a year, making Kamerun its base of operations. The cost will be about forty thousand dollars.

Mr. Camille Douls, says *La gazette géographique* of April 14, who was sent out by the French government for exploring the Wad-Dra, has been made prisoner by the natives of Cape Bojador. Mr. Tempest, chief officer of the English post at Cape Juby, however, succeeded in releasing him from the Arabs. Mr. Douls has resumed his journey up the Wad-Dra.

America.

The field-operations of the geological survey of Canada for the coming season include some important geographical work. The Yukon expedition, of which Dr. G. M. Dawson is in command

(see *Science*, April 15), set out last week. Dr. Bell will prosecute his researches in Hudson Bay, the south-west shore of which will be examined by Messrs. Low and J. M. Macoun. Professor Macoun will visit the little-known interior of Vancouver Island, principally for botanical purposes. The surveys of Mr. Bowman in the Cariboo gold-fields and the Selkirk range will add considerably to our knowledge of the geography of that district. Messrs. Tyrrell and Dowling will proceed to Duck and Riding mountains to examine the eastern outcrop of cretaceous rocks, and Messrs. Lawson, Smith, and Barrow will survey the boundary-line east of Rainy Lake. The rest of the parties will prosecute mainly geological work in the eastern parts of the Dominion.

Dr. R. A. Philippi gives an interesting report, in *Ausland* of April 11, of an ascent of the volcano Licancaur, which is situated on the eastern boundary-line of the Chilenian province Antofagasta. Former attempts to reach the summit of the mountain have been unsuccessful. Two engineers, Muñoz and Pizarro, attempted to reach the summit of the mountain, which is between eighteen and twenty thousand feet high, in order to make some trigonometrical observations. They experienced, however, so severe attacks of the *punar* (the difficulties of respiration in the rarified atmosphere), that they were prevented carrying out their intention. Their companion, Don José Santelices, succeeded in reaching the summit, and gives the following description: "The 16th of March we reached a tambo on the north-west side of the mountain. These are houses which form a single room with a low stone bank: they were built by the Inkas at regular intervals on their roads. While part of the company could not ascend much farther on account of the rarified air, the guide and myself reached the summit after nine hours' climbing. We descended into the crater, the bottom of which is formed by a plain about thirteen hundred feet in diameter, in which a beautiful pond, four hundred feet long and three hundred and fifty feet wide, is situated. It may be about five hundred feet below the rim of the crater. On its banks there are large stone walls of the houses in which the Indians used to live. There may be about thirty of these. There was a great quantity of fuel which had been carried there by the ancient Indians. An old road of the Inkas, which led to the summit, can still be recognized." Philippi remarks that these houses were probably used by a garrison for watching the approach of an enemy, and for giving signals by lighting the wood. Similar piles of wood have been found on all mountains of that district. Philippi supposes these enemies were

the Peruvians, at the time when they made war upon the brave and warlike Calchaquis, who lived in the district of Salta, which belongs at the present time to the Argentine Republic. J. J. Tschudi was probably the first to suggest that the Calchaquis retired to the oases of the Atacama desert, in order to escape the oppressions of the Inkas. This hypothesis is very probable, as the Atacama language is spoken nowadays in some parts of the province of Salta. However, it is not impossible that the Peruvians used these piles of wood for giving notice of the progress of their conquest to Cuzco. Anyhow, the fuel found on the mountains was carried there about four hundred years ago.

NOTES AND NEWS.

THE papers read at the April meeting of the National academy of sciences were as follows: 'On chemical integration,' T. Sterry Hunt; 'Results of the investigation of the Charleston earthquake,' C. E. Dutton and Everett Hayden; 'On some phenomena of binocular vision,' Joseph LeConte; 'The vegetation of the hot springs of the Yellowstone park,' W. G. Farlow; 'On the forelimb and shoulder-girdle of Eryops, and on the vertebrates of the triassic,' E. D. Cope; 'On the rainless character of the Sahara,' Elias Loomis; 'The color of the sun,' and 'A new map of the spectrum,' S. P. Langley; 'Chemical constitution and taste,' 'On a new class of compounds analogous to the phthaleins,' and 'On the decomposition of diazo compounds by alcohol,' Ira Remsen; 'On the ancestry of the deaf,' and 'On the notation of kinship,' A. G. Bell; 'On the determination of orbits of planets and comets,' J. W. Gibbs; 'On the serpentine of Syracuse, N.Y.,' G. H. Williams; 'On the barometric oscillation, diurnal and annual,' A. W. Greely; 'On Floridian geology,' W. H. Dall; 'On the Taconic system of Emmons,' C. D. Walcott; 'Is there a Huronian group?' R. D. Irving; 'On the brain of the *Ceratodus*, with remarks on the general morphology of the vertebrate brain,' B. G. Wilder; 'Outline of the ichthyological system,' Theodore Gill; 'The effect of magnetization on the electrical resistance of metals,' Arthur W. Wright.

— The coast-survey telegraphic longitude parties of Assistants Smith and St. Clair have left for Ogden and San Francisco. Their first work in extending the regular line of standard longitudes of the coast survey will be to connect Salt Lake City with the Franklin Square observatory in San Francisco. When these points are thus connected, the chain will be complete with the Sierra Roblero, New Mexico, near Fort Selden. Assistant

William Eimbeck will continue the transcontinental triangulation from Mount Nebo, near Salt Lake, and is expected to reach that station about May 20. Assistant James B. Baylor has completed his season's work of three months, having occupied twenty-three magnetic stations between Key West and Washington. For absolute measures of declination, dip, and intensity, this is considered good work for stations covering so large an area. In connection with the physical and hydrographical survey of New York bay and harbor, a much-needed work is now progressing, which consists in running a line of precise spirit-levels from the permanent tide-gauge of the coast survey, at Sandy Hook, by way of Keyport, Staten Island, Newark Bay, across New York harbor and the Narrows, up Long Island, through Brooklyn to Long Island Sound, across East River to Governor's Island, and up the Hudson River to Dobbs Ferry. A detailed topographical survey of the west half of the District of Columbia is now nearing completion, the results of which are to be published in atlas form on a scale of four hundred feet to the inch. The Patterson will leave San Francisco, about May 1, for survey-work in Alaska waters, where she will remain all summer.

— Mr. Carroll D. Wright, chief of the U. S. bureau of labor statistics, is now in Massachusetts, collecting statistics as to marriage and divorce in the United States. It will probably be a year before the data can be prepared in the form of a report. The bureau has considerable work in progress at present. The report on convict-labor will be issued in about three weeks. The report on labor-strikes will be ready this fall. Another subject of inquiry now in progress is in relation to the moral and economic condition of working women and girls in the great cities of the country. The bureau will also make inquiries into the cost of the distribution of food-staples, — how the cost of food is increased by transportation-rates, and other facts bearing on the general subject.

LETTERS TO THE EDITOR.

**.*The attention of scientific men is called to the advantages of the correspondence columns of SCIENCE for placing promptly on record brief preliminary notices of their investigations. Twenty copies of the number containing his communication will be furnished free to any correspondent on request.*

The editor will be glad to publish any queries consonant with the character of the journal.

Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.

Ethnologic results obtained upon an expedition in the south-west of the United States.

IN the subsequent columns I have gathered the results which I obtained in the furtherance of ethnologic studies during a three-months' trip in Louisi-

ana, Texas, and the parts of Mexico adjoining the Rio Grande del Norte.

I left Washington City on Oct. 5, 1886, and stopped on my way to the Mississippi only one day, to view the sites of the ancient Alibamu and Creek towns at the confluence of Coosa and Tallapoosa rivers, Alabama. The authors of the eighteenth century report three towns in the vicinity of the French fort Toulouse, — Odshi-apófa (or 'Hickory Ground'), Taskigi, and Oktehayúdsi ('Little Oktehá-yi').

Accompanied by a guide, I found the French fort, or what remains of it, at about four miles distance from Wetumpka, but several circumstances prevented me from discovering the sites of any of the settlements above named. The authors mentioned give no accurate description of their sites. The whole peninsula is sometimes flooded by high water from the Coosa River, which rises over fifty feet after long rains in the north of Alabama state, and necessarily destroys the vestiges of old habitations; and the country has become overgrown with pine-woods and shrubbery.

At the confluence of Tensaw and Little rivers with Black or Washita River there are four curious mounds in an advanced state of disintegration. One of them is of enormous height, and, as the tradition goes, had once a little pond on its top. According to another tradition, this was the spot where the retreating Natchez Indians defended themselves against the pursuing French troops in 1731. This looks more like the theory of some ambitious archeologist.

Three miles east of Pineville, Rapides parish, La., I then visited the site of a Cha'hta village and cemetery. It lay on the ground which formerly made up Solabella's plantation, and, although the village was abandoned but ten or fifteen years ago, nobody could tell me the Indian name of it. Wherever the chimneys of the cabins stood, there was a little mound or eminence; and upon every grave in the burial-ground stood a plum-tree, which the mourners used to plant to mark the head of the deceased. The main camping-place is now overgrown with horse-mint. The majority of these Indians had gone to a mission in the Cha'hta Nation some time before the secession war, a half-blood Cha'hta chief, Jim Fletcher, having prompted them to go there. Formerly these Cha'htas had annual ball-games with the Biloxis, two hundred of whom inhabited a village on the north-east bank of Red River, thirty miles above Alexandria. The ground is now owned or held by a Mr. Smith, and these Biloxis all went either to the Cha'hta Nation or among the Caddos, Indian Territory.

The Biloxi Indians, whom I saw and studied, live on Indian Creek, five or six miles west of Lecompte, Rapides parish. The unhealthy location of their present abode in the pine-woods, flooded in the rainy season, has of late subjected them to the ravages of fever. There they stay, on the property of Mrs. Martin, and make a living by working for wages. Most of them are small, sturdy people, show no trace of tattooing, and generally speak English more than their native tongue. I studied their language at Lecompte, and found at once that it belonged to the Dakotan or Siouan family. About twelve Biloxis speak or understand it: all the others — fifteen or twenty — know English only. They know nothing about earlier migrations of their tribe,

except that they came from Avoyelles parish, perhaps thirty years ago. They call their own tribe 'Táneks,' 'Táuks,' or 'Táunks,' but cannot interpret this name. The Tunicas call them 'Yóroni.' The presumption is that the other tribes living in their neighborhood when they were still upon the Gulf coast (Pascagoula, Chozettas, Moctoby) spoke Dakotan dialects also; and the discovery of the Biloxi language is of great importance, because it upsets the old theory that the so-called Cha'hta tribes of the Gulf coast, or southern Cha'hta tribes, spoke Cha'hta dialects throughout. The Bayagoulas and Mugulashas probably did so; but of the Húmas, Tchaouachas, Tohomes, Tangipahoa, and Opelousas, this cannot be said with certainty. They all used, however, the Cha'hta or Mobilian trade language as a means of intercommunication.

Before the Biloxis on Indian Creek left Avoyelles parish, they lived there peaceably with another tribe, the Tunica. Some twenty-five of these still remain in their old homes on the Marksville prairie, a little to the south-east of Marksville, the parish seat. They are the Tassenocogoulas and Avoyelles of the old documents. In the eighteenth century other Tunica villages existed besides these, — the Tunicas on lower Yazoo River, and those on Mississippi River a few miles below the Red River junction.¹ Those in Avoyelles parish called themselves Shixkal-tini, or 'flint people,' after a former chief, as alleged. Of these, I found a young man at Lecompte, from whom I obtained thorough information on his language. The only mode of disposing of the dead among the southern Indians seems to have been that of inhumation.

Comparisons made with the vocabularies of all the languages formerly spoken in the countries on both sides of the lower Mississippi River and its affluents, even with the Páni dialects, as Caddo, Yátassi, Nadaco, Wichita, have shown that affinity existed with none of them, and that therefore Tonica represents a linguistic family for itself. It has many phonetic peculiarities. The sound *f*, which is so frequent in the Maskóki dialects, is wanting here, as well as *v*. Instead of *ts*, *ds*, the language has *tch*, *dsh*. Of trills, we find *l* beside *r* and the uvular *r*, the *r* being not our rolling *r*, but the sound heard in 'mar,' 'bar.' *D* and *b* occur very seldom, and interchange with *t* and *p*, as *g* does with *k*. The surd guttural *k* almost in every instance interchanges with *xk*. This is done, for instance, in the numeral series, which is decimal, and in the name of the people itself, which may be pronounced 'Túnika' or 'Túnixka,' — a compound of *ta-* (a sort of an article, 'the'), *úni*, or *óni* ('man,' 'people'), and a suffix, *-ka*, *-xka*. The language is nasalizing, though not so strongly as Cha'hta, and is more vocalic than the latter.

In morphology the language is distinct from other southern tongues, 1°, by having a feminine besides the masculine form in the noun, pronoun, and verb; 2°, by having a dual of three persons in the pronoun and the verb; 3°, by the above article, *ta-*, *tě-*, *t-*; and, 4°, by a sort of reduplication of the radix in some of the shorter adjectives and verbs, which differs entirely from the reduplication found in the Maskóki dialects. The existence of a masculine and a feminine gender, shown by the appending of *-ku* for the masculine, and *-tchi*, *-htchi*, *-xtchi*,

for the feminine, is extremely curious, and, since it extends to the substantive noun also, finds very few analogies in American languages (northern Tinné dialects, Maya, Carib, and the disputed Taensa). The words for 'woman' (*núxtchi*) and for 'female' (*t'htchi*) contain this suffix also, and, from what I have observed, the term 'feminine' seems better applied here than 'metarrhenic,' which was proposed for similar distinctions by French linguists. I have obtained several highly interesting tales, evidently very ancient, in the Tonica language, with interlinear translation in Creole French.

Being unable to find any person who could reliably inform me of the present whereabouts of the Karánkawa tribe, once upon the Texan coast near Lavaca Bay, I repaired to San Antonio, in Bejar county, Tex. The so-called Mexicans living in and around that rising city, and selling their produce upon the large market-square, have an Indian countenance and expression, with the same ashy complexion which I had previously observed among the Káyowé Indians. They all speak Spanish, but nevertheless I was forcibly struck with the idea that these must be the descendants of the Indians once gathered into the Alamo and the four missions, now in ruins along the San Antonio River, south-west of the city. Our information upon these tribes is so defective that we scarcely know their names. It is surmised, however, that all or some of them spoke dialects of one family, which has been called 'Coahuilteco' or 'Tejano' by Orozco y Berra (1864).

From Laredo, Webb county, Tex., I went south to Camargo, and found, in the vicinity of San Miguel, the terminus of the railroad to Matamoros, the remnants of the Comecrudo ('raw-eating') tribe, who have established their cane-lodges on both sides of the track near Las Prietas. They are commonly called 'Carrizos' by the whites, but insist on being called 'Comecrudos,' the extinct Carrizos having lived at Camargo and north-west of that town. Only the oldest men and women of the Comecrudos remember the language or converse in it among themselves. A part of these Indians formerly lived in the woods to the south, at Charco Escondido. The full-blood Comecrudos seen by me were slim and tall, some of them of a whiter complexion than the Mexicans around them. The pronunciation of these Indians is remarkably clear, and only a few words contain nasal sounds. The language is lacking the sounds *f*, *r*, *tch*, *dsh*, *ts*, *ds*, *b*, and *d*, but diphthongs are frequent. Only two tenses are extant, but the noun is inflected by some cases of a locative character. A demonstrative particle, *pa-* or *pe-*, is found before almost every noun, and in some verbs also. There is also a tendency to oxytonize many words, especially substantives, although the accent shifts, as in other Indian languages.

The same simplicity and paucity of sounds is found in the Cotoname language, formerly spoken in the same district. I could find only one man living who remembered words of it, and I had to visit him several times before he could gather up his recollections so as to rely on them as truthful. As late as 1850 the naturalist Berlandier, who lived in Matamoros, had no difficulty in obtaining a full vocabulary of that language, but I obtained only about one hundred terms. It differs so considerably from Comecrudo, that I thought at first I had secured a representative of a new family, but subsequently discovered it to be a distant dialectic form of the

¹ These Tunicas were the staunchest Indian friends and allies of the French colonists on the lower Mississippi.

same stock. I could not obtain the numerals in Cotoname, but in Comecrudo the majority of them are borrowed from Nahuatl.

The Comecrudo Indians mentioned to me a number of extinct tribes, who lived in their vicinity, and spoke their language, or dialects closely related to it, but left no representatives at the time of my visit. These were the Casas Chiquitas, Tejones (or 'raccoons'), Pintos or Pakawás, Miákkán, Catujanos, and the Carrizos above mentioned. The Pintos and the Cotonames originally belonged to the northern or Texan side of the Rio Grande. The Miákkán belonged to the Mission de los Borregos, at the town of Mier, and spoke a language that was neither Cotoname nor Comecrudo.

Upon being informed by a French priest at Rio Grande City that a colony of Indians existed at Saltillo, the capital of Coahuila state, I resolved to visit that place. One day's ride upon the railroad brought me there from Laredo. The country between the Rio Grande and Saltillo can be irrigated only in a few places, for want of running water; but if that commodity was procured through artesian wells, or pumped by windmills to the surface, there would be no land more fertile on earth. The ground luxuriantly produces the nopal, guisache, mescal, palm-tree, and *uña de gato* (or 'cat's-claw') tree. The scenery, as soon as the mountain-ridges are reached, at Lampazas, is of extraordinary grandeur, the effect being heightened by the transparency of the southern atmosphere. Beyond the city of Monterey the railroad-track begins to wind up along the tortuous passes of the Rinconada, once held and strongly defended by the wild tribes of the Guachichile Indians; then it emerges into a wide, dry plain, in the midst of which Saltillo (literally, 'the small water-spring') is situated, surrounded upon all sides by the high mountains of the Sierra Madre. In this city of about 42,000 inhabitants, the Tlaskaltecs Indians, said to count about a thousand souls, live in some of the eastern thoroughfares, and in early colonial times were allotted the whole eastern quarter of Saltillo, which was founded about A.D. 1575. Over a hundred and fifty families of these Indians were then brought to this distant place from Anahuac to defend the new colony against hostile tribes, such as the Guachichiles and Borrados, who seem to have disappeared entirely since the eighteenth century. The Indians, who now speak the Tlaskaltecs language, which is almost identical with Aztec, do not number over two hundred. The language has adopted as many Mexican-Spanish terms as English has adopted words from Norman-French, or perhaps more. *La planta de mókshi* is 'sole of the foot'; *huesito de nókshi*, 'ankle-bone'; *se chorrito de atl*, 'a cascade'; *cerca de naxkoyóme*, 'around the city.' Tlaskaltecs has also lost many derivational endings from the old Nahuatl, as in *nenépil*, for *nenépilli* ('tongue').

It is quite probable that the linguistic family to which the tribes on the lower Rio Grande belong extended once to Saltillo and the rest of Coahuila, or at least to the western slope of the mountain-chain forming the Rinconada passes. But no vocabularies of these tribes are now extant, and we have to expect the concluding numbers of a publication now issued at Saltillo by Mr. Esteban Portillo, which will perhaps shed more light on this subject. The title of this book is 'Apuntes para la historia antigua de Coahuila y Texas' (Saltillo, 1886, 8°).

This title is explained by the circumstance that Texas once formed a part of the local government of Coahuila, which, from the sixteenth to the eighteenth centuries, comprised a much larger extent of territory than it does now. ALBERT S. GATSCHET.

Two ethnographic maps.

LINGUISTIC FAMILIES OF THE GULF STATES.

THE annexed map represents the linguistic families of Indian dialects within the south-eastern parts of the United States of America, as far as they could be traced through actual remnants of tribes still lingering in their old haunts, or in the vicinity of these, and by historic research. As far as the smaller stocks are concerned, their areas, or the probable limits of the territories claimed by them, are shown by lines, mostly of a rounded shape, enclosing their principal settlements, which are marked by colored dots. Full ethnographic and historic particulars of these linguistic families will be found in my publication, 'A migration legend of the Creek Indians' (1884, vol. i. pp. 11-118). In the present article I restrict myself to a few remarks necessary for the understanding of the map, and begin with the family of the

Timucua. — This Floridian stock, properly called Atimucua, extended north to a line which can be indicated only approximately, and seems to have extended farther north on the Atlantic side than on the western side towards the Chatahutchi River. It is very probable that the Kalúsa and Tekesta villages at the southern cape of Florida spoke dialects of Timucua. Tribes speaking Creek and Hitchiti dialects had intruded upon the Timucua domain since 1550 (perhaps before); and from 1706 to the present time they have inhabited its whole area, under the name of Seminoles.

Kataba. — The dialects of this family, which does not properly belong to the Gulf states, must have occupied a much larger area than is indicated by the two rings on the map. But since we possess but two vocabularies, Kataba proper and Woccon, these alone could be indicated in the map, for fear of infringing against historic truth.

Yuchi. — From historic documents, three areas could be made out for this people, which never appears prominently in history. Of these, the settlements on Chatahutchi and upper Flint rivers were the most recent. Other Yuchis existed between the Altamaha River and the northern border of Florida. In the Creek Nation, Indian Territory, they occupy a tract near Wialáka and Deep Creek, on the south shore of the Arkansas River.

Cherokee. — The settlements of this people were divided into Otali or Otari ('upland' or 'overhill') towns, and Elati or Erati (or 'lowland') villages, the latter in upper Georgia and Alabama. The limit between the Cherokee and the Maskóki family is marked approximately. The land cessions made by Cherokee Indians to the United States government are given in detail in C. C. Royce's 'Map of the former territorial limits of the Cherokee Indians,' etc., issued in the 'Fifth report of the bureau of ethnology,' with his article on the same subject (pp. 123-378), now in press.

Arkansas, properly called *Ugáxpá* (or 'down-stream') tribe, speaks a dialect of the great Dakotan or Sioux family. The subdivisions of this tribe now live in the north-eastern angle of the Indian Territory. The Biloxi, formerly on the Gulf coast, state

of Mississippi, speak a dialect of the same Dakotan stock. Some of their remnants I met in November, 1886, on Indian Creek, near Lecompte, La.

Maskóki. — This family is the largest of all represented upon the map, and from the sixteenth to the eighteenth century extended even east of the Savannah River (Yámassi tribe). The Yuchi were surrounded on all sides by the Maskóki tribes, and one of these, the Seminoles, settled in Florida in the former domain of the Timucua, and west of it, where formerly the Apalaches lived. The upper and lower Creeks held the central parts of the area; and the Cha'hta, in three subdivisions, the western parts. The Biloxi, on the coast, belong to the Dakota stock. The majority of the Maskóki tribes now live in the eastern parts of the Indian Territory, within the area marked with red lines in the north-western corner of the map.

Taensa. — The historic Taensa people were settled at two places. From their earlier settlements on the Mississippi River, west side, between Vicksburg and Natchez City, they removed to Mobile Bay, threatened by an attack from the Chicasa Indians, early in the eighteenth century. In 1762 they went to Louisiana with the Alibamus, and are mentioned there, on Bayou Boeuf, as late as 1812, by the Rev. Mr. Schermerhorn (*Mass. hist. coll.*).

Natche. — This family were the leading people in the confederacy of Theloöl, on St. Catherine Creek, near Natchez City, Miss. Since the war of 1730 they have lived scattered in various countries.

Tonika, or, as they call themselves, *Túnixka*, a people once residing at different places near the lower Mississippi River: 1°, on the lower Yazoo River; 2°, on the east shore of the Mississippi River, near the Red River junction; 3°, in Avoyelles parish, south of the lower Red River, Louisiana. I studied this vocalic language, new to science, in November, 1886, and found it to be independent of all other North American families.

Adá-i. — A small people once living between Sabine River and Natchitoches, La., which is still remembered as belonging to the Caddo confederacy.

Caddo of north-western Louisiana, and the Assinai or Cenis of middle Texas, spoke dialects closely related to each other, and, with six or seven other tribes, formed a confederacy, the remnants of which now live near Washita River, on the Kiowa, Apache, and Comanche reservation, Indian Territory.

Shetimasha. — The few Indians of this family still live at one of their old seats, at Charenton, St. Mary's parish, La., while others are farther north on Plaquemine Bayou.

Atákapa. — This language seems to have had a pretty extensive area in earlier centuries, for Dr. Sibley stated in 1805 that the Karánkawa Indians of the middle Texan coast spoke Atákapa, besides their own language. At present only two dialects are known, both in south-western Louisiana.

Karánkawa. — A people of the Texan coast, and settled there until the middle of the nineteenth century. Of their language, only twenty-five terms are known, published in *Globus*, a geographic magazine of Braunschweig, 1886 (pp. 123-125, vol. xlix.). The classing of this language as a separate family is only provisional.

TOWN-MAP OF THE OLD CREEK COUNTRY.

The numerous towns marked on this map from authentic documents subdivide themselves into

towns of the Upper Creeks on Coosa and Tallapoosa rivers, and of the Lower Creeks on Chatahutchi and Flint rivers. The Koassáti and Alibamu towns lay on Alabama River, below the Coosa-Tallapoosa junction. Witúmka, at the Coosa Falls, which was an Alibamu town, made an exception, being on Coosa River. On Chatahutchi River the upper towns spoke Creek; the lower ones, from Chiaha downward, spoke Hitchiti; Yuchi and its colonies on Flint River spoke Yuchi.

Many Creek towns mentioned in history could not be inserted here, because their location is not known with accuracy, like Tallipsehogy, Chunúnagi, Chatoksofki, Koha-mutki-kátska, etc. Others had to be omitted for want of space in crowded parts of the map.

The towns are described in my publication above mentioned (pp. 124-151). Names still used at present are written in capitals on the map. All names of this and the preceding map are spelled according to my phonetic system of alphabetic writing.

ALBERT S. GATSCHET.

Specific variations in the skeletons of vertebrates.

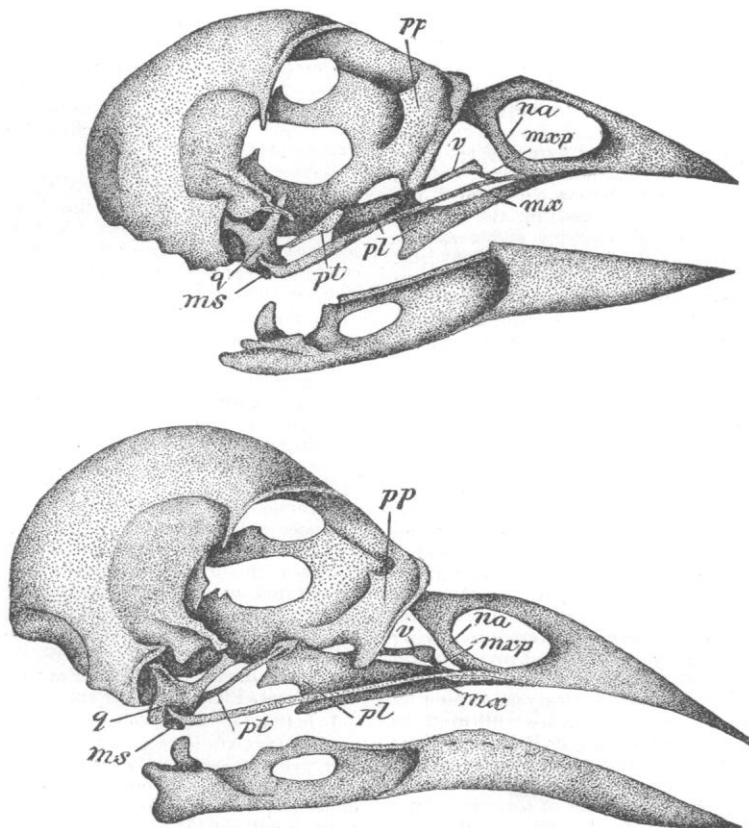
When I speak of the specific variations as they occur in the skeletons of vertebrates, I refer to those appreciable differences in form which we find to exist when we come to compare any two skeletons of the same species, or, as for that matter, a series of skeletons of the same species. As in every thing else, as we are well aware, no two skeletons, even of the same species, are exactly alike; but I have reason to believe that it is not generally appreciated how great this degree of difference may be sometimes. It has always been one of the chief drawbacks to the study of human craniology, that the skulls in *homo*, representing the same race, have frequently been found to be so thoroughly unlike, both in measurement and in general characteristics. We would come across skulls of Caucasians, with wonderfully low cranial capacities, a small facial angle, and, indeed, having perhaps many of the racial characters as they might occur in the skull of a Malay. It will be my object in the present letter to show that these differences are quite as marked among the species that go to make up the classes below man, as they are among the skeletons of the same species of men; and I will also present a number of examples chosen from the lower vertebrates to illustrate this point.

People who have given no special thought to this matter are led to believe that when they have carefully described the skeleton of any vertebrate, such a description will answer for the skeleton of that species for all time, provided specimens of the same age and habitat be chosen for comparison, and the original description was accurately recorded. Such persons have often amused me by the great stress they lay upon the numerous measurements they make, and the extraordinary pains they take to have them of hair-splitting accuracy for the skull or other parts of any skeleton they may be describing. These measurements, of course, are of very great importance, but we must bear in mind always that they are really but fractions of some standard which we should aim to eventually obtain in every case; by this I mean a standard obtained, say, by taking the

average of the measurements secured from fifty or more skulls or other parts of the skeleton. So, too, with our *descriptions* of such material, for we must remember, that, as important as the detailed account of the skeleton of any species of vertebrate may be, it will in no case exactly apply to the skeleton of another specimen of the same species, every thing else being equal.

This being the case, we should endeavor to have before us as large a series as possible of skeletons of the particular form or species we may be describing

of the skull of our violet-green swallow (*Tachycineta thalassina*). This drawing is perfect in all its details, and the subject was chosen from a series of a number of others. Notwithstanding this, fault was found with it in certain quarters, and it was said that the maxillo palatines of the specimen were broken off, whereas in reality nothing of the kind had happened, the specimen being an unusually perfect one, although in it these parts were shorter than they commonly occur. (I have since learned with regret that the person who had this fault to find, for it did not



RIGHT LATERAL VIEW OF SKULLS OF *X. XANTHOCEPHALUS* ($\times 2$).

pp, pars plana; *na*, nasal; *mzp*, maxillo-palatine; *v*, vomer; *mx*, maxillary; *pl*, palatine; *pt*, pterygoid; *ms*, mandibular sesamoid; *q*, quadrate.

with the view of giving a published account of its osteology to the world. When this is the case, it is sure to reveal its advantage in our account by the character of our description, and the weight we attach to the length of a process here, the form that a certain part may assume there, or the size, presence, or absence of vacuities and foramina, and similar details. To better illustrate my meaning, I would cite the following example: last winter I published in the Proceedings of the Zoological society of London a contribution to the comparative morphology of the swifts, humming-birds, and goatsuckers; and among the figures in the text was a drawing of mine, twice the size of life, giving the basal aspect

constitute criticism, had not a single specimen of the species before him, or available, at the time he published his remarks!) Students of human craniology who have studied long series of skulls from individuals of the same race, will at once appreciate the point I desire to convey here; for how often do we find, say, in one skull, a styloid process, for example, perhaps an inch or more in length, whereas in another specimen from the same series it will be represented by the most insignificant apophysis imaginable!

For a number of years past I have been collecting material to illustrate the very point about which I am now writing; and among this material I find

long series, amounting to fifty or more in some cases, of skulls of such forms as our western meadow-lark (*S. M. neglecta*), or our red-winged and yellow-headed blackbirds (*A. phoeniceus* and *X. xanthocephalus*). It will be impossible to detail here the differences which are to be found in these highly instructive series, as they occur for the several respective species mentioned; but I herewith present drawings which I have made ($\times 2$) of two skulls chosen from a series of skulls of our yellow-headed blackbird (*X. xanthocephalus*) to illustrate the point under consideration. One of these I collected at Fort Wingate here, last July (1886), and the other in Wyoming in 1879. The former is the upper figure, and the lower the latter; and a glance at them will be sufficient to convince us of the extraordinary differences that obtain between them, both as regards measurements and the general form of their several parts. Similar differences are to be found in the other species alluded to above: indeed, they hold good for the skeletons throughout the vertebrate series. No less marked variations are to be found, when we come to examine sufficient material, in the sternum of the same species of birds. I have already pointed this out for the American vultures in my 'Contributions to the anatomy of birds,' published several years ago, and extracted from Hayden's 'Twelfth annual' (p. 771), wherein we find some striking differences in this bone, more especially in its xiphoidal extremity. My collection also affords examples of similar variations in the pelves of birds of the same species; and I have two pelves before me of *X. xanthocephalus*, wherein in one the ilia meet on either side for a considerable distance the neural crista of the dorso-lumbar vertebrae, while in the other the reverse condition obtains, and they are separated from that median plate of bone, on either side, by a very decided interval. But space here will not admit of further citing interesting examples of these variations; nor is it necessary, for, in the light of those already presented, the entire ground may be covered by saying that in all forms, both vertebrate and invertebrate, paleontological and otherwise, when we come to compare sufficiently extensive series represented by individuals of the same species, we will find in similar structures marked variations both as regards relative size and form as we pass from one specimen to another, and if extremes be chosen the differences will be found to be in many cases of a very striking nature.

R. W. SHUFELDT.

Fort Wingate, N. Mex., April 15.

International congress of geologists. — American committee meeting at Albany.

At a meeting of the American committee (elected by the standing committee of the American association for the advancement of science to represent American geology in the International congress of geologists) held in Albany on April 6, there were present Prof. James Hall (president), Professors Hitchcock, Stevenson, Williams, Winchell, Cook, Cope, and Frazer (secretary). Professors Emerson, Smock, and Clarke, Dr. Rominger, and Mr. Beecher were invited to be present at the sessions of the committee. By unanimous vote, Mr. W. J. McGee was invited to take the place, during the meeting, of Major Powell, who was prevented by sickness from attending.

The secretary announced that there had been forty-five subscribers for fifty copies of the geological map of Europe.

A motion was adopted, abolishing the committee of the whole and its officers, and intrusting the duty of preparing reports on the separate divisions of the geological column to eight 'reporters,' who were thereupon unanimously elected (see circular letter to geologists, below).

The following was adopted by the committee: —

Resolved, that we recommend to American geologists the acceptance of the conclusions of the International congress; said changes to be formulated at a subsequent meeting of the committee; and it being understood that the committee will present such additions as are deemed necessary by American geologists, to the Congress of London in 1888.

PERSIFOR FRAZER, *Secretary*.

Philadelphia, April 22.

[To all American geologists.]

At the recent meeting of the American committee in Albany, 'reporters' were elected whose duty is to prepare reports on the several parts into which, for convenience, the geological column has been divided. The assignment is as follows: —

Quaternary, recent, and archeology, Major Powell, director U. S. geological survey, Washington, D.C.

Cainozoic (marine), Prof. E. A. Smith, state geologist, University of Alabama, Tuscaloosa county, Ala.

Cainozoic (interior), Prof. E. D. Cope, 2102 Pine Street, Philadelphia, Penn.

Mesozoic, Prof. G. H. Cook, state geologist, Rutgers college, New Brunswick, N.J.

Upper paleozoic (carbonic), Prof. J. J. Stevenson, University of the city of New York.

Upper paleozoic (Devonic), Prof. H. S. Williams, Cornell university, Ithaca, N.Y.

Lower paleozoic, Prof. N. H. Winchell, state geologist, University of Minnesota, Minneapolis, Minn.

Archaeon, Dr. Persifor Frazer, 201 South 5th Street, Philadelphia, Penn.

It is the duty of these reporters to obtain as complete information as possible, each for his own subject, from American geologists interested in it: but, on account of the difficulty of ascertaining the names of all who have information to impart on a particular topic, it will not be possible to address letters to more than a few of those who are known to have studied a subject. For this reason each of the undersigned appeals to *all* his professional brethren for aid in preparing the report which is intrusted to him. It is not possible that any single scheme will be approved by all geologists, and therefore it is the more necessary that there should be a fair statement of any opposing views in each report. These reports will be submitted to criticism and discussion at the next meeting of the American committee, to be held probably next August; and an effort is being made to have them discussed formally in Section E at the meeting of the American association for the advancement of science, to be held afterwards. With such advantages for knowing the views of our countrymen, there seems every prospect that the American representation at the next congress will exercise an influence proportional to the importance of its constituency.

Geologists who have convictions as to classification, nomenclature, coloration, or any of the numerous subjects brought before the last congress (which are similar to those to be brought before the next): or who believe that the congress has erred in any of its recommendations: or who have original observations or deductions bearing upon any part of the seven subjects above assigned to reporters, are earnestly requested to communicate their views as soon as possible to the reporter having in charge the subject to which they relate. Those who neglect to do this cannot justly complain if their individual views are neglected in the reports.

GEO. H. COOK, J. J. STEVENSON, H. S. WILLIAMS, N. H. WINCHELL, E. D. COPE, EUGENE A. SMITH, PERSIFOR FRAZER,	} <i>Reporters of the American committee, International congress of geologists.</i>
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Instruction in natural history.

The recent discussion in the columns of *Science* on the teaching of natural history has revealed so wide a difference of opinion, and leaves the question in so unsatisfactory a state, that an additional word may not be out of place. It seems clear that no discussion of special methods can advance matters until naturalists reach some agreement as to the general educational uses of the biological sciences, yet the lack of such agreement is a conspicuous feature of the series of letters with which we have been favored.

It will probably be agreed that a college course in zoölogy or botany should aim, first, to arouse an interest in animals or plants, and to impart clear and accurate knowledge of them; and, second, to cultivate the power of independent observation. But, after agreeing that both these ends must be held constantly in view, we must still decide which of them shall be foremost. Which is the higher ideal of scientific study, — to have students, first of all, learn to use their own eyes, and not simply to verify some one else's description, or to weigh and discuss the nature, meaning, and causes of the relative affinities of organized beings? It is plain enough that independent observation by the student is the only method that can give life and reality to the study. It is no less certain that a main claim of natural history to a place in education rests on the value of the training afforded by observation; and we have the explicit statement of high authority that 'the first thing is to learn to observe.' But, in full view of these facts, let us suppose that an intelligent non-specialist has the hardihood to ask, "Is observation the first thing; or is it not, after all, a *means* rather than an end in itself?" Unless we are ready to admit that natural history is a mere drill, the answer must be that its real aim is to teach something, first, of the special phenomena of life; and, second, of the generalizations of biological science illustrated by them; and the problem to be solved is how to make this instruction most effective as an instrument of education.

Now, it is undoubtedly an effective lesson to the future naturalist to be made to stare at one dead fish for three long days, and to classify *Haemulon* solely by the light of nature; but is such a lesson likely to develop the latent scientific tastes and capabilities of

the average college sophomore? I think not; and, while no one would seriously advocate such a method for college classes, it may reasonably be asked whether the reaction against the dull and barren cramming of text-books may not sometimes carry us from one extreme to the other, and even close our eyes to the fact that the student of natural history is a rational being, who really possesses a degree of common sense comparable with that of students of other sciences.

It is my decided opinion as a practical instructor that the methods so successfully employed in elementary instruction in physics and chemistry may guide us to the true method of teaching natural history. No teacher of chemistry would commit the absurdity of setting apparatus and chemicals before the beginner and directing him simply to 'experiment.' It is generally admitted that the beginner should receive precise and somewhat detailed instruction before or during the laboratory study, and that he is thus enabled to work with interest and intelligence, and to *gain time*, without loss of independence. It would be hard to find any valid reason why this is not equally true of the beginner in botany, zoölogy, or physiology. Moreover, every teacher knows that students possessing a good degree of mental power and general intelligence are not seldom more or less deficient in those practical capabilities collectively known as 'gumption.' Why should such students be compelled at the outset to fritter away valuable time in the discouraging attempt to make independent observations, which usually result in vague and confused ideas and a distaste for the study? I believe that *beginners* in natural history should be prepared for the laboratory by a clear and tolerably full account of what they are to do and see; and the more books and figures they have, the better. Afterwards, when the strangeness has worn off and a certain facility has been acquired, students can be led naturally and easily to depend more and more on themselves, and to find a pleasure and profit in independent work that was impossible at the start. Whatever be the comparative merits of such a method, there is no doubt, as a matter of experience, that it arouses interest, and gives fulness and accuracy of knowledge; that it saves time for the student, and cerebral protoplasm for the instructor, and as a matter of fact does *not* make students slavishly dependent on books or demonstrators, but, on the contrary, tends to develop independence and originality. It has been said, truly enough, that you cannot teach a boy mountain-climbing by taking him up Mount Washington on a railway. Neither can you teach him by leaving the youngster at the foot of the Alps with the parting injunction to climb immediately to the top. X.

April 25.

Barometer exposure.

The question of barometer exposure has been prominently brought to the front by *Science*. On the one hand, it has been claimed that the wind, in blowing across the mouth of a chimney, would at times produce a vacuum amounting to .10 of an inch; and, on the other, it has been denied that any marked effect would occur, as the air would flow in through cracks, especially on the windward side, and fill up the partial vacuum, if such were

formed. Most of the observations relied upon for proving this effect have been the traces of a barograph recording upon Draper's principle, and there have been very few actual observations of a barometer. Quite recently there have been observations of a barometer, under varying conditions, on Mount Washington, with wind-velocities of eighty and ninety miles. The results have been published in the *Monthly weather review* of the signal service, for February, 1887, and are so interesting that a brief review of them is here given. The chimney in the signal office on Mount Washington is about two feet square, and has three inlets into the office-room. One of these is a ventilator near the top of the room, and the other two have stove-pipes running from three stoves. It is quite evident that the chimney has a fair communication with the room. The experiments consisted in reading a mercurial and an aneroid barometer, 1°, chimney closed; 2°, chimney opened; 3°, same as 1°; 4°, leeward window open; 5°, same as 1°; 6°, windward window open; 7°, same as 1°. The successive readings were made quite rapidly, though generally three or four minutes elapsed between each of the seven conditions. Five sets are published with the wind from sixty-five to ninety miles per hour. Under 2° (chimney open), the pressure fell twice mean $-.0065$ of an inch, and it rose three times mean $+.0037$. Under 4° (leeward window open), four times the pressure fell $-.019$, and once it rose $+.002$. Under 6° (windward window open), the pressure rose mean $.043$. Making due allowances for imperfect connection between the chimney and the room, it must be admitted, I think, that there is no evidence of a partial vacuum being formed by the suction of winds, up to sixty-five and ninety miles per hour, blowing across the chimney.

The most interesting results, however, are those with the window open to windward. In an eighty-mile wind, experiment would indicate an increase of pressure of about .44 of an inch, but here we find the total effect one-tenth of that. It seems to me that the effect of wind on the barometer has been much exaggerated, and we may rest assured that our observations during very high winds have not been vitiated so very much. It may be of interest to note that this same slight 'pumping' or uneasiness of the barometer was noted by Mr. Beall, the observer on Mount Washington in 1883. In making his comparative readings of the station and extra barometers at the end of each month, he found it necessary to

exercise the utmost care and speed in order to make correct readings during very high winds. The total oscillation seldom reached .01 of an inch.

H. ALLEN.

Washington, D.C., April 25.

The barometer during thunder-storms.

My attention has been called to the fact that the time given for the squall of July 21, 1885 (printed '1886' by mistake in your last issue), did not agree exactly in time with the sharp depression of the barometer shown on the diagram accompanying my letter on p. 392. This was due to an error in the barograph clock, which was then new, and not well adjusted. Mr. Alexander McAdie, who had charge of the station on that day, and Mr. Frank Brown, were watching the barograph during the squall, and both state that the depression of the barograph was coincident with the occurrence of the squall. The squall was so violent that Mr. McAdie wrote that 'life for a while did not seem certain.'

H. HELM CLAYTON.

Blue Hill meteor. observ., April 23.

The source of the Mississippi.

I am in receipt of a pamphlet, entitled 'The source of the Mississippi,' from Ivison, Blakeman, Taylor & Co., and am pleased to see therein that the laurels deservedly won by Nicolett and others are maintained to them. My father, Basil H. Beaulieu, who had charge of a trading-post on Lake Itasca in 1846 for the American fur company, and who in 1847 accompanied, as assistant geologist, the first geological party (Dr. Norwood, Whittlesey, and others) that went over and drafted Itasca and Elk lakes in going to Red Lake, and went over the lakes again on their return, and also drafted the Mississippi from its source to Dubuque, Io., — concurs in the opinion, as established by the late survey, that Nicolett was the first man that gave to the world of science a faithful and honest report upon, and maps of, the source of 'Gitchetebe' (or 'mighty-water') River, — the Indian term for the Mississippi. It certainly seems shameful that the vain ambition and venturesome spirit of the Captain Glazier stamp should seek at this late day to aspire to and appropriate to itself laurels nobly won by deserving men in the cause of science half a century ago.

THEO. H. BEAULIEU.

White Earth, Minn., March 21.

CROSBY'S VITALIZED PHOSPHITES

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SCIENCE.—SUPPLEMENT.

FRIDAY, APRIL 29, 1887.

HEALTH MATTERS.

A theory of consumption.

THE origin of consumption continues to be a subject of discussion and also of experimentation. Several theories have been advanced and evidence adduced for their support. The older idea was that the disease was hereditary, and that one in whom the 'seeds of consumption' were planted, as it was expressed, was already condemned. Subsequently the dampness of the soil was declared to be the principal factor in producing the disease. Still more recently the theory of contagion has been developed, and the bacillus tuberculosis has been regarded by Koch and his followers as its germ. While there are some who maintain that heredity is never to be considered as a factor, the majority of physicians are not prepared to accept this, even though they may be inclined to look upon the bacillus as playing the principal rôle.

During the past year a fourth theory has been advanced by G. W. Hambleton, licentiate of the King's and Queen's college of physicians, Ireland. The theory that consumption is caused by climatic conditions, changes of temperature, or wetness of soil, he combats most vigorously. Instead of being limited to, or even more prevalent in, any particular climate, he finds it co-extensive with the civilized world. That it is more prevalent below than above certain altitudes does not help the theory much, for within these same limits are found living the vast majority of the human race free from the disease. At Madrid and certain cities in South America which are at high altitudes, phthisis exists, while among some Asiatic tribes inhabiting districts lying below the sea-level, it is unknown. In cold climates, as Canada and Sweden, there is little consumption; and the same is true of those classes most exposed to cold in all regions. In the severe winter of 1854-55, fewer men died from it in camp at Sevastopol than in the barracks at home. In France, consumption prevails least in that department which has the dampest soil; and in Lincolnshire, as drainage is introduced, the ague disappears, and consumption takes its place. In reference to the bacillar origin of the disease, he claims that neither physicians, clinical clerks, nor nurses, who

are constantly exposed to the bacilli, have ever been known to become phthisical through attendance at hospitals where consumptive patients are treated.

Wherever civilized men permanently congregate, whether on the level of the sea or at any altitude, in every part of the world, irrespective of what is called climate, there consumption is to be found or speedily makes its appearance. The natives of America, Africa, and the South Sea Islands were entirely free from consumption till they came in intimate relationship with civilized Europeans. Even now in the interior of Africa there are tribes, who have not come in contact with civilized men, that are absolutely free from this scourge. Phthisis is a disease of civilization, and in the conditions of civilized life must be sought an explanation of its cause. Those dwelling in cities are more affected than those living in the country, and those engaged in sedentary occupations than those living in the open air, consumption being remarkably low in agriculturists and fishermen, and rare among gypsies. The military life ranks high in the list of those occupations that are favorable to consumption.

The explanation given by Mr. Hambleton of these facts is, that man, in a state of civilization, does not hold himself erect: he stoops more or less. The weight of his shoulders is thrown on the thorax, and consequently the latter is impeded in its movement, and his chest is narrow. Man, in the uncivilized state, holds himself erect; the weight of his arms is borne by the spine; his chest is broad, well developed, and freely movable; and he passes the whole of his existence in active exercise in the open air. The trades and occupations that supply the greatest number of cases are those in which small particles of various substances are constantly inhaled, those that necessitate little movement or even a cramped position of the chest, and those where a considerable time is spent in small and badly ventilated rooms. In the army those who become phthisical are those who have a chest capacity below the average. In short, the conditions that produce consumption are those that reduce the capacity of the lungs below a certain point.

In support of this theory, Mr. Hambleton gives the results of some experimental investigations which he has made, in the form of the following propositions: 1°. That artificially induced reduction of the breathing surface of the lungs below a

certain point, together with the prevention of compensatory action of other organs, is followed by a local and general state not to be distinguished from consumption; 2°. That arrest of this artificially induced reduction of the breathing surface of the lungs, together with induced compensatory action of other organs, is followed by relief of the prominent symptoms, and improvement of the general state; 3°. That artificially induced full development of the breathing surface of the lungs is followed by an entire absence of all symptoms of disease, and by general good health.

In corroboration of these propositions, Mr. Hambleton calls attention to the invariable association of phthisis with confinement. In a convent in Paris all the nuns became phthisical, while the portress, who was not subjected to the same regulations, and went out daily for supplies, remained in good health. Perfectly healthy men, brought up in the country, have gone into towns, and engaged in occupations that either necessitated long hours, in close rooms, in cramped positions, or the inhalations of particles of dust, and after a time have become ill with all the symptoms of consumption. This disease has thus been shown to be produced by two distinct sets of conditions: in the one we have those that reduce the breathing capacity by habitual disease of the lungs; and in the other, those that reduce the breathing capacity either by habitual compression of the chest or by injury to the lungs.

The prevention of consumption is, according to this theory, a very simple one, — to place all persons under conditions of habitation, clothing, education, and habits that tend individually and collectively to develop the lungs, and that prevent or obviate compression of the chest or injury to the lungs. These views of Mr. Hambleton are very fully set forth in a brochure entitled 'What is consumption?' and in a paper read at a meeting of the British association, on the scientific prevention of consumption.

SOME months ago a number of persons went from Glasgow to Loch Fyne to see a large blasting operation in which six and one-half tons of gunpowder were exploded. A short time after the explosion many of the observers became faint, six of the number died almost immediately, one died shortly after, and five others were very ill but recovered. The cause of death is believed to have been the carbonic oxide generated from the gunpowder. It is estimated that the amount must have been 468 pounds, — a quantity sufficient to occupy 6,333 cubic feet of air space, or to vitiate for respiratory purposes a space one hundred times

as great. There were also generated 3,575 pounds of carbonic anhydride; so that, in all, there were 1,266,000 cubic feet of air rendered irrespirable.

— Dr. D. F. Lincoln, in a letter to the *Boston medical and surgical journal*, narrates a personal experience in Savannah with a kerosene-stove. In a room containing 1,100 cubic feet of air space, he introduced a kerosene-stove for heating-purposes, being able to raise the temperature by its means eighteen degrees. Although there was some odor, nevertheless he did not experience any personal discomfort. One evening he noticed that the reading-lamp was dim, the flame having shrunk to half its size. When he carried it into the entry, it burned brightly. He subsequently tested the air with Walpert's air-testing apparatus, and found the amount of carbonic acid had reached sixty-seven parts per thousand, the normal amount being three or four parts. Each of the two burners in the stove was four inches in length, and generated as much carbonic acid as eight or ten common lamps. In a well-built house with tight doors the effect might be doubled.

— In the *British medical journal* are reported two cases of chronic cocaine-poisoning. The patients were a man and wife who had formerly been addicted to opium, and who had taken cocaine as an antidote. They commenced with small doses, but finally took daily 2.5 grams hypodermically. The prominent symptoms were incoherence of ideas and optical delusions. They saw on their hands, on the beds and walls, small spots and worms of all forms. Complete recovery followed the discontinuance of the cocaine.

— The figures representing the mortality of a great city like London for a single week are appalling. During the week ending Jan. 1, 1887, there were registered in that city 1,899 deaths, of which 114 were from measles, 25 from scarlet-fever, 27 from whooping-cough, and 17 from typhoid-fever: 74 deaths were caused by violence, 66 being the result of negligence or accident, and 7 being suicides.

— A physician of Cairo has been treating an opium habitué with cocaine, the result being that a cocaine habit was soon established, the patient so enjoying the sensation produced by the drug as to be led to use it on the slightest provocation. At one time the amount injected hypodermically was one and a half grams daily. As a result, he suffered from a condition similar to delirium tremens, became greatly agitated, and had hallucinations. He fired a pistol at imaginary objects, attacked his servant, and was at last put into a hospital. He recovered subsequently, injections of morphine being the treatment adopted.

*A SYSTEM OF ORTHOGRAPHY FOR
NATIVE NAMES OF PLACES.*

THE Royal geographical society of London, and the Société de géographie of Paris, have each adopted a system of geographical orthography which is intended to put an end to the existing confusion in the mode of spelling in maps and books. We fully agree with the first rule set forth by the Royal society, — “No change will be made in the orthography of foreign names in countries which use Roman letters: Thus, Spanish, Portuguese, Dutch, etc., names will be spelt as by the respective nations.” The second rule is, “Neither will any change be made in the spelling of such names in languages which are not written in Roman characters as have become by long usage familiar to English readers: thus, Calcutta, Cutch, Celebes, Mecca, etc., will be retained in their present form.” Though this rule may give rise to some doubt as to what names have become by long usage familiar, it may be accepted. We should prefer to retain anglicized foreign names, e.g., Munich for München, Milan for Milano, Normandy for Normandie, instead of introducing the original form, as the first rule demands. The new system does not provide for the spelling of names in languages written in foreign characters. Of course, German and Danish must be classed among the languages to which the first rule refers. But it is doubtful how Russian and Polish names shall be spelled. In the Polish language the Roman, in the Russian the Cyrillic, alphabet is used, and yet the sounds of the languages are very similar. It would be inconsistent to apply to the one the first rule, while the other is spelled merely according to the sound. It would have been desirable that the society should have expressed its opinion on this point more precisely. The phonetic rules do not decide whether it is correct to spell Kasimov, Kasimof, or Kassimov, nor will we be able to decide whether it be correct to write Trnova, Ternava, Ternova, or Tirnova.

The third rule is, “The true sound of the word as locally pronounced will be taken as the basis of the spelling;” and the fourth, “An approximation, however, to the sound, is alone aimed at. A system which would attempt to represent the more delicate inflections of sound and accent would be so complicated as only to defeat itself.” Both these rules are good, as far as they go. Any linguistic alphabet would be too complicated for the general reader, and therefore the idea of applying it must be at once rejected. The alphabet upon which the society has decided follows the principle that vowels are pronounced as in Italian, and consonants as in English. This does away with the *ee* for the sound *i* in ‘ravine,’ and with the *oo* for

the *u* in ‘flute.’ The rule that vowels are shortened in sound by doubling the following consonant is not good, as repetitions of consonants occur in many languages, and short vowels are of more frequent occurrence than long ones. Therefore it is better to mark the long ones. The French alphabet is in many respects better than the English. This is particularly true in regard to the introduction of the circumflex for marking the length of a vowel, and of the apostrophe for indicating exploded sounds. The German *ö* and *ü*, which are not in the English alphabet, are expressed by the letters *oe* and *ü*. The use of *dh* for the soft *th* (as in ‘these’) is another improvement.

Both systems, though materially improving the system of orthography of geographical names, are open to criticism. Whoever has any experience in reducing languages to writing, and has compared his notes with those of other students, or even the notes written before any knowledge of the sound and structure of the language was obtained, with later ones, will acknowledge that the sound as perceived by a traveller is in no way binding. The individuality and nationality of the author give the sound a peculiar character which not at all corresponds to the word as pronounced by the natives. In Central Africa, for instance, we find *r* and *l* or *j* and *ch* constantly interchanging, according to the nationality of the explorer. The rules adopted by the societies named can only help the explorer who is not at all acquainted with linguistics — which every explorer ought to be — to write down the names in an intelligible form. They are in no way sufficient for determining the proper spelling. This ought to be done by linguists, and the results of their studies laid down in a gazetteer. It is impossible to decide by a rule whether it is correct to write Uganda or Waganda; Urua, Warua, or Kerua, though the linguist will know that the first is the name of the country, the second that of the people, and the last the adjective form. On the English admiralty charts we find numerous mistakes. Native names are mistaken for English, and misspelled so as to make the meaning intelligible. In Davis Strait we find the name ‘New Gummi Luck.’ The correct name is ‘Nugūmiut,’ and means ‘the inhabitants of the cape.’ On the north-west coast of America we find the place ‘Bella Bella.’ Though this name has become that of a settlement, its origin dates back to a misunderstanding. The channel on which it is situated has the name ‘Milbank Sound.’ The natives of that district cannot pronounce this word, and say ‘Bilbal,’ which is transformed into ‘Bella Bella’ by the English traders and seamen. Similar mistakes occur everywhere. For these reasons it is impossible to

lay down a few rules that would enable us to spell any geographical name correctly. The system adopted by the Geographical society, however, is a decided improvement, inasmuch as every letter has only one meaning, and there is no room for doubt in the pronunciation of a written name. Therefore *Science* will adopt this system, with the improvements made by the French geographical society.

The pronunciation of letters will be as follows:—

a = *a* in 'father.'

e = *e* in 'there.'

i = *ee* in 'feel.'

o = *o* in 'mote.'

u = *oo* in 'fool.'

ö = *e* in 'her.'

ü = *ü* in German: München.

ai = *i* in 'ice.'

au = *ow* in 'how.'

b, d, f, j, k, l, m, n, p, r, s, th, t, v, w, z, ch, as in English.

g = *g* in 'garden.'

h is always pronounced, except in *th, kh*, and *gh*.

kh = the oriental guttural.

gh = another oriental guttural.

y = *y* in 'yard.'

Vowels are lengthened by a circumflex. Letters are only doubled when there is a distinct repetition of the single sound.

PSYCHIC BLINDNESS.

IN this book Dr. Wilbrand has put together a most valuable and interesting series of facts and discussions concerning certain curious and important morbid phenomena. The appearance of such a book furnishes an excellent illustration of the great value and importance of the new view of brain-physiology. This view really takes its origin in the discovery of the electric irritability of the cortex by Fritsch and Hitzig in 1870. Their results at once led to more exact and adequate conceptions of the nature of brain-centres; and, when the pathologist and alienist came to study the forms of brain-lesion and impairment of function with the conceptions derived originally from physiological experiments, the advance step was a great one. And finally psychology must already acknowledge a debt to pathology probably greater than it owes to any other of the many sciences with which it is so intimately associated. Our mental structure is so extremely intricate and so wonderfully formed, that we must use all pos-

sible devices to simplify the problems it offers to the psychologist: hence the study of the less complex minds of the lower animals, the observation of the developing faculties of children, and the records of the primitive culture of man, derive their importance. Pathology performs an even more delicate service. It takes away or incapacitates more or less of this complex machinery, and shows in what way the working of the apparatus is thereby affected. Just as we never really appreciate the value of an object until we are without it, so the importance of certain brain-cells to mental sanity is not realized until disease renders them useless.

Some years ago Professor Munk described the condition of dogs from whose brains a certain cortical area had been removed, and gave it the name of 'psychic blindness' (*Seelenblindheit*). A dog in this condition can see, for he avoids all obstacles as well as ever, but what he sees has lost all meaning for him. If, for example, the dog was accustomed to jump over a rod when it was held before him, he no longer recognizes this signal: his whole psychic life is duller, and, in particular, the world of sight has lost all significance. This is now only one of a large series of phenomena which show that there is one centre in which an object is seen and another centre in which it is perceived, or, better, apperceived. Disease may injure one and leave the other intact. Dr. Wilbrand records two very remarkable cases of this nature, in both of which the patient retained normal intelligence, and accurately described the symptoms. The first is reported by Charcot, and relates to a highly intelligent merchant well versed in several languages, and reading the classics fluently. Up to the time of his attack, he could repeat the whole of the first book of the *Iliad*, beginning at any point. He had from his boyhood a most remarkable memory, which was almost exclusively a visual one. He could read pages of his favorite authors from the visualized picture of the page which he carried in his mind. If an incident of his many travels was spoken of, the whole scene appeared before him, vivid and complete in every detail. He was an expert draughtsman, and often sketched interesting portions of the landscape on his travels. As a consequence of serious business troubles, his health gave way: he became nervous and irritable, and the peculiar visual symptoms appeared. He found that the sight of the buildings and the scenes of his daily walks seemed strange. If asked to picture a certain place to himself, he was unable to do so. The attempt to draw a church-spire resulted in a rude childish scrawl. He could not remember the faces of his wife and children, and even failed

Die Seelenblindheit als Herderscheinung und ihre Beziehungen zur Homonymen Hemianopsie zur Alexie und Agraphie. Von Dr. HERRMANN WILBRAND, Wiesbaden.

to recognize his own image in a glass. Even the familiar scenes of his childhood had faded from his memory. In order to understand what he read, he had to cultivate an auditory memory, and read every thing aloud. He no longer dreamt of seeing, but only of hearing. Deprived of the mental imagery which sight furnished, and which in his case was a more serious loss than to persons with less brilliant visualizing powers, his mental life became sluggish and his moods melancholic and sad. The second case from Dr. Wilbrand's practice is no less remarkable, and presents certain peculiar characteristics. Chief among these is a falling-out of the left half of the visual field; that is, the patient could not see with the outer portion of the left retina nor with the inner portion of the right retina (homonymous hemianopsia). This symptom indicates a unilateral cortical lesion.

Dr. Wilbrand analyzes the process of vision one step further. He gives reasons for believing, that, besides the centre for the reception of the visual impression and that for its apperception, there is a third group of cells, whose function it is to store up visual memories, which form the visual memory-area (*Erinnerungsfeld*). If the retina or the optic nerve is destroyed, the result is blindness in the usual sense of the word. But the optical memory remains intact; the visual phantasy is still active; sight hallucinations and dreams may occur, and so on. If the apperceptive centre of one hemisphere is involved, then homonymous hemianopsia of the opposite half of the visual field occurs, and there is psychic blindness in one-half of the brain. If both apperceptive centres are involved, sight hallucinations are impossible; but the visual memory is not directly affected, and sight dreams may occur. If the memory-area is diseased, objects are no longer recognized as familiar: all seems strange and new. The fantasy is dulled: there are no visual imageries or dreams.

Many of these suppositions receive a striking confirmation from the observation of those born blind and restored to sight by successful operations. Such persons are just like infants as regards sight, except that they learn to see much more quickly. Their higher sight-centres must be developed, and in this process one can distinguish the three stages above marked out. Such persons recognize at once after the operation that they have a new sensation, — they see. But the object before them is not apperceived: it is not recognized as the same object they have been touching all along. They soon learn the meaning of their visual impressions, though they constantly call on the sense of touch to prevent deception; but they often fail for some time to re-

member what they have seen, and rarely dream of seeing things for many months: in other words, their apperceptive and visual memory-centres are developing. The chapter devoted to this topic records other interesting points in these cases, and can be recommended as an admirable account of the subject.

The rest of the book is devoted to the explanation of the detailed pathological symptoms and the discussion of their relation to the centres of language, both written and oral. This more technical part of the subject does not readily admit of a brief exposition. Suffice it to say that Dr. Wilbrand has rendered an important service to several branches of science by this convenient and thorough account of a most important topic. Some of his theories are doubtless to be modified and perhaps rejected by future research, but the spirit and point of view of his exposition is in the right direction. As was said at first, it shows the vast explanatory power of the modern theories of brain-physiology.

J. J.

BASCOM'S SOCIOLOGY.

HERBERT SPENCER, who has done more than any other one man of this generation to popularize the study of social science, points out very forcibly, in his book on the 'Study of sociology,' the difficulties which beset the student of social phenomena and conditions. He shows us there that something is true of sociology that holds good in no other science; namely, the facts to be observed and generalized by the student are exhibited by an aggregate of which the student himself forms a part. His functions and life as a citizen, therefore, determine in a large measure his stand-point and methods as an investigator. It is on this account essential, in estimating the value of sociological researches, that we know something about the personality of the observer. In the case of President Bascom we are peculiarly fortunate in this respect. His long and honorable career as a teacher and professor both in the east and in the west, as well as his numerous writings in the fields of philosophy, literature, and religion, afford us ample information as to the methods and postulates of his thought.

In fact, this newest book from his pen is best understood when read in connection with his previous books on psychology, ethics, and the philosophy of religion. The tone and the style of treatment are the same in all.

In his preface to the present work, President Bascom expressly says that his aim has been to cover a large field suggestively, rather than a nar-

Sociology. By JOHN BASCOM. New York, Putnam. 12°.

row field exhaustively. He believes that in some cases this method is of more practical value than its contrary. Sociology he defines as "a discussion of the conditions and laws of combination and growth in society." In the following sentence he adds that this definition includes change which is retrogressive as well as that which is progressive. It is plain that any good definition of sociology must include retrogressive change, inasmuch as a considerable school of thinkers assert that the world and society are becoming worse all the time. Perhaps the substitution of the word 'development' or 'evolution' for 'growth' in the above definition would have obviated the necessity for this explanation, because it is well understood nowadays that evolution includes progress from good to bad as well as from bad to good.

The author's various chapters on custom, government, economics, religion, ethics, and so on, are of much interest, although very sketchy in character. His style is good, and enlivened with numerous illustrations of the argument. One of the first questions to be asked about a book of this sort is, What position does the author take in respect to the pressing questions of socialism and the limit of governmental functions? We can best answer this in President Bascom's own words. "The office of the state," he says (p. 45), "is not simply to recognize a primitive equality of rights, and to grant these rights the protection we term justice. Such a course will soon issue in extreme equalities. It has the far more difficult duty of encouraging and aiding unimpeded activity in every class, and at the same time renewing its conditions in each class. Each citizen is, under general principles, to be put back as speedily as possible on his feet when he has lost them. The race is to be renewed, morning, noon, and night, on equal terms. The state must then be benevolent as well as just. While it takes from no man what he has, it must not allow any man such an exercise of his powers as will ultimately swallow up the powers of other men. . . . The state must put positive limits on powers, when, by natural force and the conferred energy of society, they are ready to break the bounds of prosperous and beneficent competition."

There is much in President Bascom's chapters on ethics and religion that is suggestive, especially his comprehensive use of the word 'morality,' and his illustrations of the degenerating process as to particular parts of a religion which usually accompany *its* development. The publishers would have greatly increased the value of the book had they provided it with an index. Unindexed books are a relic of barbarism.

JUKES-BROWNE'S HISTORICAL GEOLOGY.

THIS volume completes the 'Student's handbook of geology;' the first part, on physical geology, having appeared in 1884. The author states his intention as being "to give as full an account of the rocks of Great Britain and Ireland as space would permit, supplementing this with only so much of continental geology as is necessary to fill up the gaps in the British records and to complete the outline of geological history." After a brief but excellent introduction on the laws and applications of paleontology, the book proceeds to a review of the formations, giving a chapter to each system. An account of every separate area in the British islands is given under each formation, with numerous sections and illustrations of characteristic fossils, and each chapter closes with a statement of what is known or inferred of the physical geography of the period. Some departures from the divisions of geological time usually employed in America and on the continent of Europe will be noticed. Thus the Cambrian is regarded as a distinct 'system,' as is the lower Silurian, for which Lapworth's term 'Ordovician' is taken. It is interesting to notice that Mr. Walcott's studies lately published lead him to a similar result for this country. More novel is the division of the tertiary rocks into two systems, for which Mr. Jukes-Browne proposes the terms 'Hantonian' (including the eocene and oligocene) and 'Icenian' (including the miocene, pliocene, and pleistocene). The quaternary is thus given an entirely subordinate position.

The science of geology includes such a great number of distinct subjects that no one man can master them all, and for this reason the text-book of the science that shall be equally satisfactory in all departments has yet to be written. Probably it can only be written by the co-operation of many specialists. The first part of Mr. Jukes-Browne's handbook, that on physical geology, is excellent, and will be found most useful to American students; but the volume before us cannot be of nearly such general value, as, from its plan, it is adapted only to Great Britain. But even there we think the comparatively minute study of British formations, to the exclusion of the rest of the world, is a mistake. It is true, that, in whatever district the English student may be, he will find a clew to its geological structure in this book; but this advantage is more than counterbalanced by the loss of a general view of the earth's developmental history. Such a method must give the beginner very disproportionate views, and result in the loss of all 'perspective.' American

The student's handbook of historical geology. By A. J. JUKES-BROWNE. New York, Scribner & Welford. 8°.

geology, which throws so much new light upon the subject, is almost completely ignored.

Mr. Jukes-Browne is not a biologist, and his remarks on the structure and affinities of extinct organisms are not always happy. The anatomist will hardly agree with such statements as the following (p. 437): "Of the mammals, *Coryphodon* and *Lophiodon* resembled the recent tapir; *Palaeotherium* and *Paloplotherium* were animals from which both the rhinoceros and the horse seem to have descended; *Hyracotherium* was a small animal combining characters now found in the peccary and the hyrax or Syrian coney." On the same page the snout of an alligator is inverted and called the lower jaw. Our author seems not to have heard of the great paleontological discoveries of the last twenty years on this side of the Atlantic, as he mentions only the mastodon, of which a wretched figure is given, and the mammoth.

It would, however, be very unfair to leave the impression that this is a carelessly written book. It is nothing of the sort, but, on the contrary, has been compiled with painstaking accuracy, and in many respects has been admirably done. While it cannot be recommended as a text-book in this country, it will prove of great service to investigators as a book of reference and comparison, containing much valuable information in a small space.

BERGHAUS'S ATLAS OF PHYSICAL GEOGRAPHY.

THE geographical institute of Justus Perthes in Gotha is publishing a new edition of Berghaus's 'Atlas of physical geography' ('*Physikalischer Atlas*'). Though the editor retains the name of the old edition of 1838-48 and of 1852, this is a totally new work, not one of the old maps being used in the new edition. The most eminent authorities in the different branches of physical geography contribute to this work, each department being intrusted to a specialist. Berghaus himself is the author of the hydrographical part, and to him is due the excellent execution of the work, which comes up to the standard we are used to apply to works published by Justus Perthes. J. Hann edits the meteorology; G. Neumayer, the part on terrestrial magnetism; von Zittel, geology; O. Drude, geography of plants; G. Hartlaub and W. Marshall, the distribution of animals; and G. Gerland, the ethnological part. The names of these scientists warrant that the material will be reliable, and in every respect be kept up to date. The maps are copperplate prints, and bear the date of publication. This way of re-

production will enable the publisher to have any desirable corrections made, so that we may be sure to see the maps always corresponding to the latest state of our knowledge. The economical use of space on the single sheets is really admirable. Map 16, for instance, contains the drainage-areas of the oceans, which are represented in Lambert's equivalent projection. These maps show the limits of ice-drifts, currents, deltas, and the navigable extent of rivers. On the same sheet we find eleven detail-maps showing the different kinds of bifurcations, and two diagrams showing the extent of land in different latitudes.

The general principle of the atlas is, first, to give maps of the earth and of continents, showing the distribution of physical phenomena; and then detail-maps, which are particularly illustrative of it. On the map showing the annual rainfall (No. 37) we may observe the influence of elevation and wind on detail-maps of Jamaica, Mauritius, and New Zealand. On the map of the German Ocean (No. 23) we find the various types of coasts, — the rias of the north coast of Spain, the downs of France and Germany, and the fjords of Norway. Diagrams show the temperatures of the ocean. This atlas is an indispensable work for the student of physical geography. Its systematically selected contents and excellent execution make it a worthy companion of Stieler's 'Hand-atlas' and Spruner-Mencke's 'Historical atlas.' As the editor does not give any preference to the physical geography of Europe, it is as valuable for the American student as for the European.

A CENTURY OF ELECTRICITY.

THOSE whose curiosity is excited by the presence on every street-corner of an electric light, and in every doctor's office of a telephone, in every railway-station of a clicking telegraph instrument, and yet have been unable to find time or opportunities for understanding how these things have been brought into existence, will find in Professor Mendenhall's little book, 'A century of electricity,' a trusty guide which will lead them by easy steps from the beginnings of a science of electricity towards the end of the eighteenth century, through the discoveries of Galvani, Volta, Oersted, Faraday, and others, to the present time. Professor Mendenhall's success as a writer is too well known to need especial praise in this place. The author has endeavored to sketch the growth of the science of electricity and its principal applications. The book is not a history of the science, nor is it a scientific treatise, and the use of technical language has been avoided as far as

A century of electricity. By T. C. MENDENHALL. Boston, Houghton, 1887. 16°.

possible. The effort of the author, and it has been a successful one, was to enable the intelligent reader, unfamiliar with the nomenclature of the science, to understand the more important phases of its development, and to give him such a knowledge of its fundamental principles as will enable him to comprehend the meaning of what he sees in electrical devices with which he almost daily comes in contact. The book opens with an account of some experiments in submarine signaling, as they might well be called, made in April, 1749, by Benjamin Franklin, which pictures him as sporting with his pet sparks at a picnic-party on the banks of the *Skuyllkill*; and frequently through the pages one discovers little sketches of the personalities of the investigators, which add much to the interest of the reader. We can recommend the book most highly to all those for whom it is intended, and commend the publishers for the way in which it has been brought out, and for the excellence of the illustrations, which present so few of the hackneyed cuts disfiguring the ordinary manual.

THE third part of 'A new English dictionary on historical principles' (Oxford, Clarendon press; New York, Macmillan, 1887) has been received. We reviewed at length the first two parts in *Science* of June 18, 1886. Part iii. deals with 8,765 words, from 'batter' to 'boz.' It is a characteristic of the letter B that it contains a comparatively small number of words derived from Latin or Greek, and a preponderating proportion of words of Teutonic origin: hence this section includes many of the oldest words of the language. The B-words are full of problems which have baffled the efforts of all investigators. Every one of these has received a fresh and independent investigation, in which assistance has been rendered by some of the first living philologists; and the result has been the discovery of new facts, or the elimination of old errors, in regard to many words. In addition to the words of Old English and Old French origin, this part contains an extraordinary number of words of unknown or uncertain derivation. Many of these have no kin in other languages, but stand quite alone in English, and, it cannot be doubted, are more or less recent creations of English itself. B contains many illustrations of the fact that has of late years powerfully impressed itself upon philological students, that the creative period of language, the epoch of roots, has never come to an end. The origin of language is not to be sought merely in a far-off Indo-European antiquity, or in a still earlier pre-Aryan yore-time: it is still in perennial process around us. A literary language, with

its more accessible store of words already in use and sufficient for all ordinary requirements, its more permanent memories and traditions, its constant appeals to an authoritative precedent, is hostile to word creation. Such is not the case with language in its natural state, where words are estimated simply as they serve their purpose of communicating the thought or feeling of the moment. The unwritten dialects, and to some extent even slang and colloquial speech, approach in character to language in its natural state, aiming only to be expressive, and treating memory and precedent as ministers, not as masters. Some words so coined pass at length from colloquial into literary use, and are registered in the dictionary as new words, the origin of which is searched for as vainly in the word-board of Old English speech, or even the fullest vocabulary of Indo-European roots, as in a school-manual of Latin and Greek roots and affixes.

— Bulletin No. 31 of the U. S. geological survey, by S. H. Scudder, is a systematic review of our present knowledge of fossil insects, including myriapods and spiders. It is essentially a translation, for the benefit of English readers, of the text furnished by the author to Dr. Zittel for his 'Handbuch der Paleontologie.' The German text, however, is accompanied by more than two hundred illustrations. M. Barrois is also publishing a French version. Each section of the work is accompanied by a complete bibliography, which shows us at a glance how recently this department of paleontology has been developed, very few of the titles dating back of 1850, and how extensive and varied the author's own contributions have been. The concise descriptions of the classes, orders, and families, are accompanied by brief notes on the fossil genera and species, with the locality and geological horizon in many cases; while the stratigraphic distribution and range of each order are shown by tables giving the number of species found in the rocks of each age. No fewer than twenty-six hundred species of true insects have been found fossil up to the present time. The great majority of these, as well as of myriapods and arachnids, are from the middle tertiary. This great irregularity in the chronological distribution of the fossil forms, which is, of course, due largely to the character of the deposits, is a plain indication that important insect faunas still remain to be discovered. Thus, of the fossil spiders, thirty-one forms are known from the paleozoic strata, one from the mesozoic, and two hundred and eighty-five from the tertiary, the great majority of the tertiary forms having been found in the amber deposits of Prussia.